THE
# METAL INDUSTRY
WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

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# Plating and Lacquering in the Bell Laboratories

## A Description of the Plant Used for Experimental Work in Finishes on Telephone Equipment by the Bell Telephone Laboratories, Inc., New York

By W. G. KNOX
Assistant Plant Superintendent

FROM BELL LABORATORIES RECORD, DECEMBER, 1929

THE importance of the finish of metals in the telephone plant is apparent from the extent to which it is found. Affecting both appearance and function, finish of one or another sort is almost universally applied to metal telephone apparatus. Materials for finishing purposes are investigated, sometimes developed, and specified to the Western Electric Company, by these Laboratories.

W. G. Knox

To meet the needs of the Laboratories for finishes which would be the equal of those produced by the Manufacturing Department at Hawthorne, and for a means of applying special metal coatings to models of new telephone apparatus and equipment constructed in the Shop from engineering sketches, the Laboratories' metal-finishing facilities were reconstructed in 1919. The room and the equipment constituted what was at the time a model layout for plating, with the recognized cleaning, plating and drying features generally used by industrial firms and with added refinements in structural details and in the excellent quality of the equipment that was employed throughout.

Plans for the room were developed by engineers of the Plant Department. Walls were lined to the height of six feet with acid-resisting tile and floors were covered with acid-proof brick, on top of concrete; the whole was made water-tight with an asphaltic filling. Suitable drains were built in at several points. That the job was thorough is attested by the fact that after ten years the floor and walls are still in excellent condition.

The plating solutions heretofore most largely used in finishing telephone apparatus were copper, nickel and zinc; these three metals were applied to more than ninety-nine per cent of all parts receiving a metal finish. A limited demand for baking japan and lacquer finishes was taken care of by the installation of a small spraying unit and a baking oven in one end of the plating room.

For the past several years, however, it has been recognized that the available facilities were inadequate for carrying on some of the various types of work which were constantly being requested by the engineers. There was also a demand for a somewhat more careful control of finishes, particularly of their weight and character, since in many cases close tolerances limited the amount of metal that should be applied. Furthermore it was desired to have the same facilities and technique available at the laboratories as at the manufacturing plants for producing standard finishes.

The general rapid growth of the Laboratories made apparent the necessity of providing facilities for future as well as for present requirements, and plans were drawn up to this end. Space limitations prevented a full realization of the contemplated enlargements, but the new departments, which have recently been completed, are expected to take care of the requirements for some time to come. The new Finishing Department is divided into two main sections; one is used for the application of japans, lacquers, paints, varnishes and enamels, and the other for metal plating, facilitating a considerably increased diversity and refinement of finishing.

The japan and lacquer section is located on the third floor, in section "E," and is divided into two large rooms with a fire wall between them. Of two more small adjoining rooms, one is used to take care of all incoming work and finished outgoing work, and the other is used for a laboratory where chemical control analyses are made.

In one of the large rooms, used for the application and baking of japan and varnish coatings, there is a three-by-three-by-seven foot DeVilbiss spray booth, with a direct exhaust system removing spray fumes at the rate of about 1,000 cubic feet per minute. Next to this booth

is a steam-heated drying oven which is used for semi-drying the freshly applied films. There are also two electrically heated ovens for baking japan and crystalline varnish or lacquer films. The three ovens are connected with a small central blower which removes the fumes

A particularly excellent feature of the Lacquer Department is a built-in concrete drying room (eight-by-ten-by-seven feet) with steam heat controlled by a motor valve. Thermostatic control actuates the motor valve and permits very careful regulation of the temperature. Like

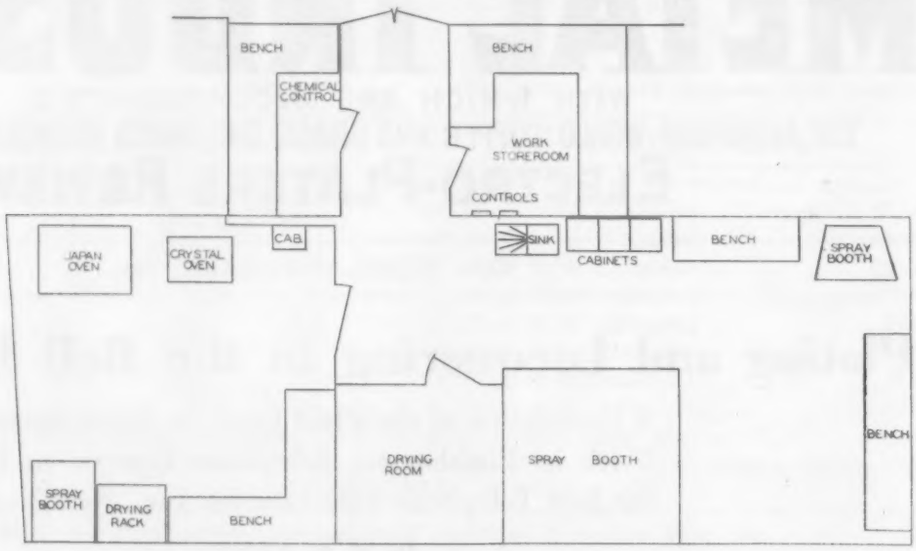



**Fig. 1—Floor Plan of the Lacquer and Japan Finishing Rooms.**

from these units at a gentle rate, thus preventing the accumulation of excessive amounts of volatile solvents. Metal containers with self-closing doors are used for storing cans of paint and lacquer materials; safety cans contain solvent thinners and cleaning solutions. Ample bench space assists the operator to handle all incoming apparatus.

In the adjoining room, somewhat larger in size and used mainly for lacquer spraying, there are two spray booths, eight-by-seven-by-seven and three-by-three-by-two feet. The larger is equipped with an indirect exhaust system of the latest type: an outlet flue, free of fans and motor shafts, removing about 5,000 cubic feet of air per

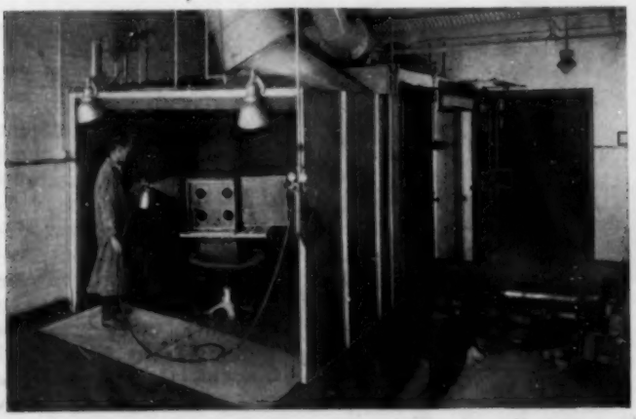


**Fig. 2—Mounted on a turntable in the large power-ventilated spray booth, big apparatus is sprayed by Thomas Cassidy. The apparatus is later dried in the oven directly behind the booth.**

minute. This booth meets a long-felt need by enabling the operator to spray very large apparatus and framework parts without the danger of lacquer spray blowing around in the room. The smaller booth copies the Western Electric Company's design for repair shops, with a series of built-in baffles to remove solids and pigments from the excess lacquer spray before it passes into the outer air.

the baking ovens of the japan section, this oven has a blower for removing volatile fumes.

For protection against fire or explosion, lights and light switches are provided with vapor-proof covers, and power switches and relays for the ovens are installed in an outer room.

The plating room has been greatly altered and, like the japan and lacquer rooms, is considered a model of its type. The equipment includes apparatus and machinery for preparing and plating the surfaces of articles in a variety of ways.

Since the best plate can be secured only upon surfaces that are chemically clean and free from rust or tarnish, every effort has been taken to provide the necessary tanks and materials for cleaning metal surfaces. Acid, alkali and steam fumes are removed through a new type of exhaust system designed and built by engineers of the Plant Department. It is constructed of a special alloy to prevent corrosion, and draws all fumes away from the operator so as to free him to work over the tanks

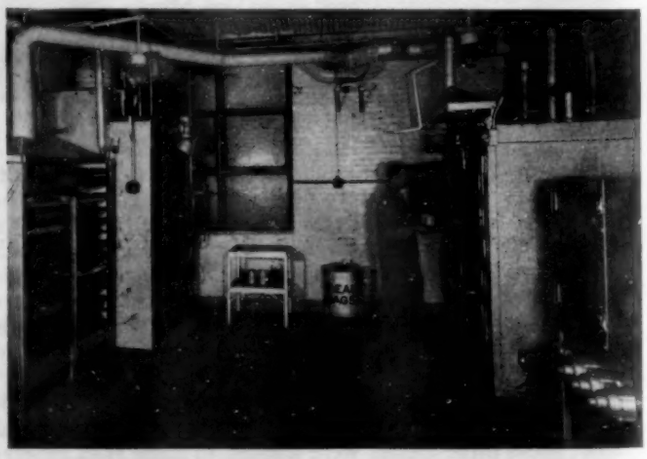


**Fig. 3—The japan room. Left to right: drying rack, small spray booth, baking oven (into which Charles Stone is placing equipment he has just sprayed), and crystallizing oven. Exhaust systems are coupled to all these units.**

without discomfort. Replacing the old plating solutions which have been modified or discarded for newer types, the Department now has available a selection which includes almost every metal that is in commercial use today. The solutions available are: nickel for ferrous and non-ferrous metals; zinc (acid and cyanide); copper (acid and cyanide); chromium; silver; tin; gold; cadmium; brass. Steam heat has been installed for heating those solutions which practice has shown to operate better when warm.

The electric equipment consists of two motor-generator sets, each designed to give six or twelve volts. One generator is rated at 500 amperes capacity and the other at 2,000 amperes capacity. The latter is used exclusively for chromium plating.

To keep the cleaning and plating solutions in good working condition, frequent chemical tests are made. In the case of the gold plating solution, for instance, which involves a high investment, tests for free sodium cyanide and for gold are made almost daily. This frequent testing is necessitated by the great quantity of work which is plated in a bath of such small proportions: sometimes as many as a thousand parts are plated weekly.

Chromium plating requires especial attention,—the temperature of the solution and the "current density" used for depositing the metal must be carefully controlled. Special "racking" of parts also aids in securing a good chromium deposit. For removing the fumes generated during chromium plating operations considerable care has been used in designing an exhaust hood which will be effective yet in no way interfere with the operator's access to the tank.

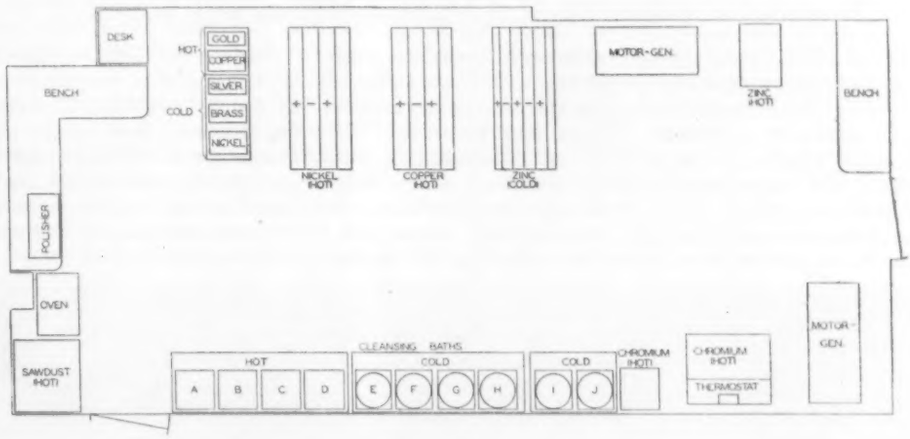



**Fig. 4—Floor Plan of the plating room. The cleansing baths are: A—clean water; B—soap solution; C—preliminary wash water; D—alkaline electrolytic cleaner; E—bright acid dip; F and G—hydrochloric acid pickles for (F) steels and (G) brasses; I—cyanide dip; H and J—clean running water.**

**Fig. 5—In the plating room, of which C. E. Wenzel (right) is foreman, current for the large plating baths is controlled from individual switchboards, at one of which is A. B. Celner. Current for the smaller baths is controlled at the switchboard in the foreground.**

The magnitude and variety of work constantly passing through the new Finishing Department is great: practically every unit is in constant use, and during many weekly periods about 20,000 parts are given a finish of one kind or another. In many cases the parts to be finished require two or three separate metal coatings and in other cases five or six coats of japan or lacquer.

The Finishing Department cooperates with engineers of the Laboratories in applying finishes to parts used in the assembly of special apparatus and of finishes which are employed for comparative test purposes. Every care is used in applying special finishes in accordance with the wishes of the engineer or with standard practice. In producing many finishes, the data gathered from the work carried on by the Finishing Department has been useful as a basis for formulating specifications issued to the Manufacturing Department or the Repair Shops of the Western Electric Company.

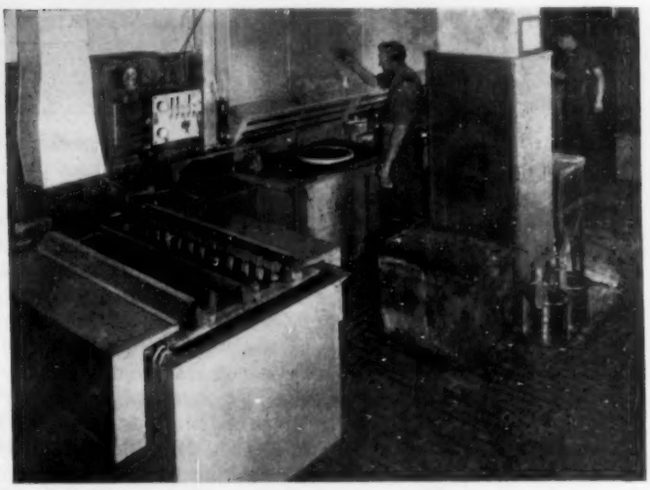


**Fig. 6—The large and small chromium baths are supplied with current from a special motor-generator out of the picture to the left. At the cleansing baths are W. Frees (left) and P. Ferrarotto.**

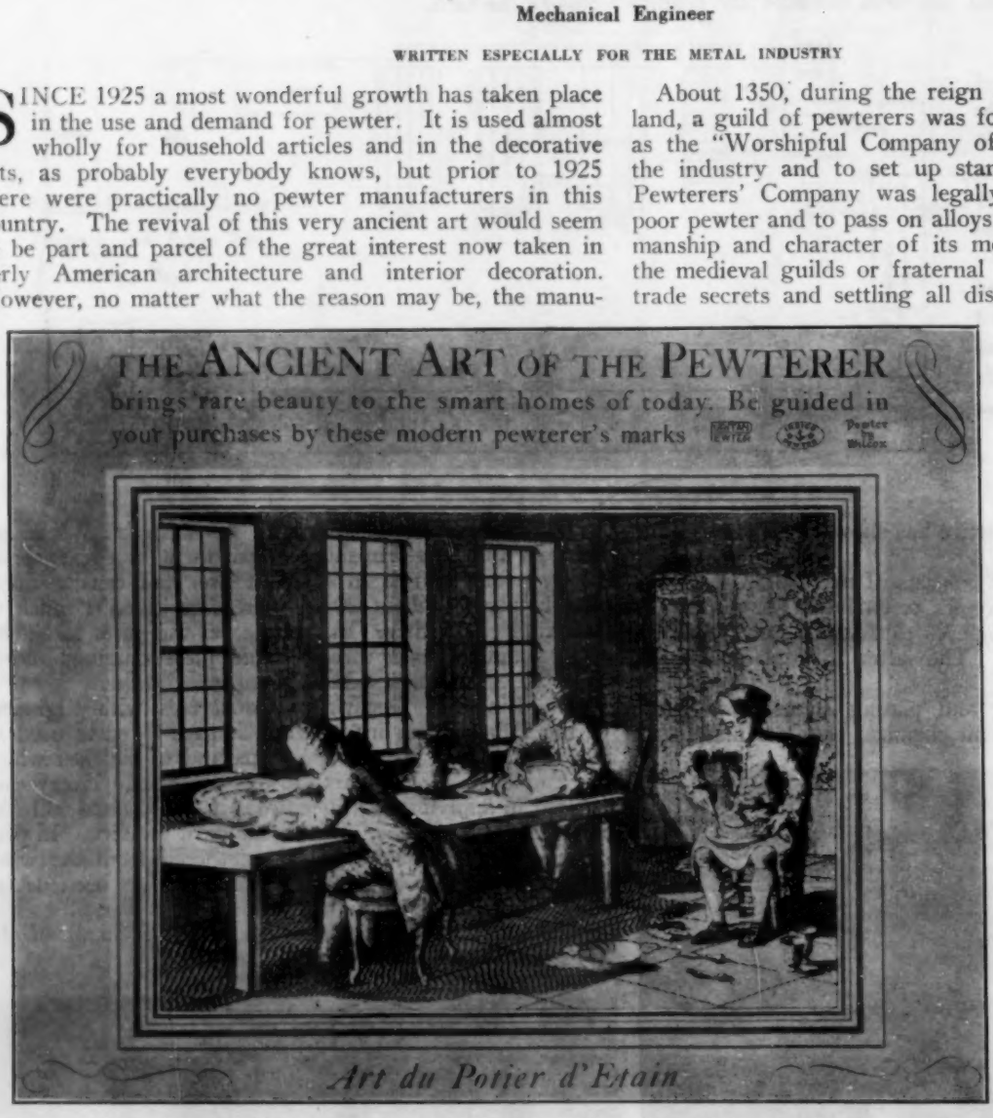
# Pewter

## An Exhaustive Treatment of the History and Development of the Manufacture of This Interesting Material. Part 1

By FRANCIS A. WESTBROOK
Mechanical Engineer

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

SINCE 1925 a most wonderful growth has taken place in the use and demand for pewter. It is used almost wholly for household articles and in the decorative arts, as probably everybody knows, but prior to 1925 there were practically no pewter manufacturers in this country. The revival of this very ancient art would seem to be part and parcel of the great interest now taken in early American architecture and interior decoration. However, no matter what the reason may be, the manufactures of pewter for 1929 are estimated at something surprisingly high in value.




Reproduction of an Old French Print, "Art du Potier d'Etain"—"Art of the Tin Potter"—Used as a Window Card by a Modern Pewter Manufacturer. It Shows French Pewterers at Work Centuries Ago.

Before entering into any discussion of the manufacturing problems of today it will be interesting and also give perspective to the subject to look briefly into the historical background of this very attractive ware. What comes afterward will then have much more point.

### Historical

Pewter was used very widely by the Romans and ancient Chinese and Japanese. While comparatively little is definitely known about pewter in Europe from the fall of the Roman Empire until the eleventh century, there is no good reason to doubt that it was used at least to some extent. There are definite records of its being used in churches in France and England about 1075 and during the Middle Ages itinerant pewterers traveled from town to town to repair and recast damaged pieces, frequently adulterating it by surreptitious addition of lead.

About 1350, during the reign of Edward III of England, a guild of pewterers was formed which was known as the "Worshipful Company of Pewterers," to protect the industry and to set up standards of quality. The Pewterers' Company was legally authorized to destroy poor pewter and to pass on alloys as well as on the craftsmanship and character of its members. It was one of the medieval guilds or fraternal societies maintaining its trade secrets and settling all disputes between its members by its own court of justice, which was empowered to exact fines and even to expel offenders. The Guild furthermore limited the manufacture of pewter to its members or their apprentices and prohibited employers from enticing workmen from one another, but it was the authority in admitting all workmen of proved competence.

By the beginning of the seventeenth century pewter came into its most flourishing period. It was used by all classes except the lowest, who used wooden trenchers and bowls and the very highest who used silver. As a result of the Reformation in England and Scotland there had been an enormous loss in the sacred vessels which were being replaced with pewter as required by the church authorities unless finer metals were used. It was during this time that a number of new articles were made, such as bowls, cups, pots, flagons, and so on, which were used both for ecclesiastical and secular purposes.

During the eighteenth and nineteenth centuries the Pewterers' Guild steadily lost influence, partly because

it tried to exert too much power, partly because the country was swept with civil wars and partly because of that bête noire of all industries, the development and substitution of something new. In this case it was the introduction of cheap earthenware and china for household uses and later the discovery that the pewter alloy known as Britannia Metal could be used as a base for silver plating.

However, the Pewterers' Guild set standards of design, quality of workmanship and metal which are emulated and admired to this day; and it is most significant that the workmen themselves insisted on these ideals.

By the middle of the seventeenth century the art of making pewter had taken root in America and it flourished there for nearly two hundred years, or until about the middle of the nineteenth century. The reasons for this prolongation of life were the economic and social conditions in the colonies. While in the mother country more highly ornamented, but generally less artistic, plated ware came into favor with the more sophisticated ways of life, the economical simplicity of pewter was far more consistent with the rugged colonial ways of living. It was more or less a duplication in this respect of the seventeenth century England and Scotland when pewter originally came into its own, and in both instances the masses used pewter and only the very rich silver.

The centers of the importation and afterwards also of the manufacture of pewter ware in the colonies were Boston and New York, although a good deal was made in other parts of New England. In fact, some of the original manufacturers are still making pewter. One of these is the firm of Reed & Barton, of Taunton, Mass., which originally started in as a pewterer in 1824 and later on added silverware. The experience of this manufacturer shows how pewter came and went and has now come back again. With the increasing prosperity of the country, about 1850 silver plated ware came into demand, so this company turned to the manufacture of these products. As the cost of living and keener appreciation of the aesthetic increased in our own time, this firm after an existence of over a century returned to its original patterns again and is now making an interesting line of pewter of great importance.

As the machine age advanced in this country pewter began to go out and pottery, glass, china and other materials took its place which seemed to fit in better with the new scheme. But with the interest now taken in art and decoration and in our own historical background, pewter has once more come into its own. The simple, graceful and beautiful lines and shapes developed by the ancient craftsmen are again appreciated by a large discriminating public. As a result pewter is having a remarkable run in this country at the present and there is every indication that it has come to stay a long time.

The great thing about modern pewter is that it is moderate in price and it is now made in complete table services. When properly cared for it has all the beauty of silver with an added quaintness and softness. It must be kept polished, with any good silver polish, just like silver, to look its best, but whereas silver needs polishing about once a week, pewter needs it only about once a month, depending of course a good deal on atmospheric conditions.

A large number of concerns are now engaged in manufacturing pewter ware. There are large plants where quantity production methods are employed which will be described in a later chapter, and small plants specializing on reproduction of some particular forms and building up a profitable business. The majority of these manufacturers are in New England, especially those of the latter type, which are scattered through Massachusetts and Connecticut. For instance, at New Milford, Conn., on the Housatonic River, is the Merwin-Wilson Company, where one of the reproductions specialized on is a pewter pitcher made originally by Paul Revere of Boston, another by R. Dunham of Portland, Me., and a plate made by Edward Danforth of Hartford. A description of this kind of operation will also be given later on.

In addition to this, the making of pewter utensils is being taught as a handicraft in many institutions offering art courses of this type. It was Professor William H. Varnum of the Department of Applied Arts of the University of Wisconsin, who apparently was the first to recognize the possibilities in this direction. He started classes of his own and in 1925 published a book on the subject, and it is felt by many that Professor Varnum has done more to create the present demand for pewter than any other person in the United States. However this may be, the handicraft is being taught in this country, Canada and Mexico by universities, colleges, high schools, trade schools and art schools. Furthermore, pewter ware is now being carried and sold by practically every first class dealer in the country. With this general picture of the industry before us it will be interesting, as well as more intelligible, to examine some of its details.

### Alloys

The term "pewter" carries a more or less definite picture to the minds of most moderately well informed people. One thinks of a comparatively soft metal drinking cup or plate, for instance, which was used in ancient times and which has, on the whole, rather pleasing and satisfying lines. Probably it will be pictured as of dull lustre but that is because we are thinking of un-refurbished antiques. Actually pewter which is kept as it should be, and was kept in the olden times by the tidy little Dutch girls of New Amsterdam and the equally immaculate Puritan maidens of New England, was polished until it shone like silver, although less coldly. This is about as much, if not more, than the average person knows of it.

When it comes to the alloy of metals of which pewter consists and which naturally is of the greatest importance, there is no such thing as clearness. There are probably now almost as many farmulae as there are manufacturers. Most people think that pewter is largely lead but this is not the case. Some pewter, especially the very oldest, contains some lead but the general consensus of opinion seems to be that, except under certain special conditions, it is best to omit lead altogether.

The very ancient pewter of the Romans averaged about 75 per cent tin and 25 per cent lead. The better grades were later improved by the use of brass, copper, zinc, bismuth and antimony for lead and the cheaper grades were given more lead. Late French and English pewter was in general a mixture of 100 parts tin to 5 of copper for the better grades and 100 parts of tin to 15 parts of lead for the poorer grades. These of course are approximations, for many of the old formulae are lost, but the Pewterers' Guild of England definitely prohibited the use of lead under any circumstances and, until its decline, expelled any member caught substituting it.

Pewter is now frequently sold under the trade name of Britannia Metal. Professor Varnum in his book entitled "Pewter Design and Construction," states the relation between pewter and britannia perhaps as clearly as it can be done and as there is a good chance for confusion here, the terms being often used synonymously, it will be well to quote what he says. "We can regard britannia as an excellent grade of pewter," he writes, "and for modern uses superior to it in that the absence of all lead allows the use of modern pewter with complete safety for foods

of acid content. Britannia, furthermore, is a trade name for an alloy in the white metal group of modern industrial practice and as such occupies a prominent place as a base in the manufacture of plated ware."

Old britannia was an alloy of 150 parts tin, 10 of antimony and 3 of copper. More modern alloys contain 91 parts of tin, 7.5 parts of antimony and 1.5 of copper. When properly cleaned and polished the color is much like silver, although, as already stated, having a softer and in many ways a more pleasing sheen, at least according to the taste of many people of artistic discrimination.

The principal constituent of pewter has always been tin because of its whiteness and non-tarnishing qualities as well as its ductility. Lead has always been looked upon more or less as an adulterant although it plays a technical part in making the alloy more ductile and easier to work and mold. It has two very undesirable characteristics, however—those of causing rapid tarnishing and of being injurious to health when acid foods are eaten from such containers. Lead also dulls the color even when highly polished and kept clean.

Antimony is much better to use than lead because it lacks these unfavorable characteristics, provides sufficient ductility and has the added valuable characteristics that it hardens the mixture, and when poured in molten condition into a mold it expands slightly on freezing and so fills out the details of the design very fully. Lead on the other hand, contracts slightly and is very soft.

Copper is added because of its ductility, its higher melting point and the smoother surface which its presence makes possible. Bismuth is sometimes used to lower the melting point of an alloy where a very hot fire is not available for casting.

Two typical alloys used today are mentioned in Professor Varnum's book which show how the constituents are varied according to the purpose for which the metal is to be used. "No. 1 is an alloy of 90.7 per cent tin, 7.8 per cent antimony and 1.5 per cent copper and is best for hammered projects with a minimum amount of raising. No. 2 has 92 per cent tin, 5 per cent antimony and 3 per cent copper, and is of a softer grade, which spins and hammers much more readily."

There is now no standardization of formulae among the various manufacturers so far as can be ascertained. Each seems to have his own ideas, often based on generations of manufacturing experience, of what mixture will give the best results for his section of the trade. Of course, the particular designs, desired colors, finish, the use to which they are to be put and the price class of the goods are determining factors. Tradition doubtless is a strong influence.

A large proportion of the pewter producers make their own mixtures. They have their own melting furnaces and buy the ingredients. With such large concerns as the International Silver Company this may be the economical thing to do, especially as they have a large, well organized plant for the production of base metal for plating. On the other hand, metal producers like the National Lead Company manufacture pewter (without lead, which it considers very undesirable in pewter) in flat, rectangular sheets, circles or otherwise, from .008 inch to one inch thick, and according to several formulae. At the present time most of this goes to various schools where art metal courses are given and to some large individual pewterers.

Obviously, if a series of formulae could be agreed upon as standard to cover the usual run of conditions, which certainly seems theoretically possible, it would appear altogether probable that attractive economies could be realized by the pewter manufacturers without injury to their art; for it would then be practicable for the large metal producers, who are naturally in a strong position to make pewter sheets economically, to provide a large proportion of the manufacturers with their raw material cheaper than if they made it themselves, all things considered. Very likely something will be done in this direction before long, as the formula question certainly is chaotic at present. This of course is natural with a new industry, as we must consider this from the modern standpoint, and it always takes some appreciable time, first for the necessity for standardization to develop, second for the need to be realized and then for action to be taken. How great the economies are which might be gained in this way it is impossible to say with any degree of definiteness, but that they would be real is questioned by but few. Standardization and simplification has always proved beneficial wherever tried and there is no reason to suppose that it would be otherwise in this instance. It would also be most helpful in educating the public, for then the salesmen, the advertisers and the publicity men would have something tangible to talk about.

### Manufacture

As with most manufactured products dating back to antiquity, the early methods are of great interest because the modern methods are so plainly based on the old. The latter, with the help of electrical drive, improved machinery, time studies, technical control and all the rest, have been changed from manual processes to quantity, machine production, but nevertheless the original technique is still easily recognizable. This is as true of the pewterer's art as of that of the hatter and weaver.

The punch press and spinning lathe were as well known to the Pewterers' Guild as to us, but for a time at least the Guild outlawed the use of machinery. Beating down, raising and casting were the only methods then countenanced, and of course they are still used for certain necessary kinds of hand work.

The casting was formerly done in very accurately made brass molds owned by the Guild and rented to its members. Later on sand molds were used, but these had the disadvantage of leaving rough surfaces which it was expensive to polish and iron and brass molds came back. Spinning, when used, was for hollow-ware as it is today. The hand tools were and are about the same as those used for copper working.

Ancient pewter was divided into "Sad" Ware and Hollow Ware. Sad ware consisted of chargers for boars' heads, trenchers and other large pieces which were too large to be made in molds. They were hammered from flat sheets and usually finished by polishing on a lathe. The metal used for sad ware also was given as much copper as it would absorb to provide ductility for hammering. The term "sad" is thought to have come from "saturated," referring to the fact that the alloy was saturated with copper. The sad ware pewterers were considered inferior to the hollow ware men.

It was the hollow ware men who cast their porringers, tankards and the like in molds, finishing them with hammering and using the lathe as little as possible. This set them on a higher level than the sad ware men and it is an interesting comparison between our time and theirs that they definitely sought to do everything possible by hand, whereas we try to do everything possible by machinery.

When it comes to modern methods of manufacturing, the best way to see what they are like is to take a trip through one of the modern quantity production plants. There are also many small modern plants where the quantity of production is small because a special line or two is made and these also are interesting. To give the more complete picture of the industry, we will take a short trip through one of these plants as well, but not until later.

**This series will be continued in an early issue.—Ed.**

# Machining Aluminum and Its Alloys

## Tools Used on Brass or Steel Are Not Satisfactory

R. L. TEMPLIN
Aluminum Company of America

FROM "BLACK AND WHITE," JANUARY, 1930

THE rapidly increasing use of aluminum and its alloys in the structural, aeronautical, marine, automotive and railway industries has given rise to many inquiries concerning the best methods of machining these metals.

It will be appreciated that while particular types of tools can be indicated for certain typical machining operations, we cannot give specific feeds and speeds for machining aluminum; these are dependent, to a large extent, upon the machine in which the work is done, the dimensions of the work, the shapes of the tools, the character of the coolant used, the operator, and many other factors.

### Watch Your Angles

The most important requirement of tools for machining aluminum is the cutting angle of the tool. Experience has shown that too often the machinist attempts to work aluminum with tools similar to, or identical with, those normally used on brass or steel; whereas much better results would be obtained if tools similar to those used in cutting hardwood were used. This may be understood better by referring to Fig. 1, wherein the ranges of the cutting angles for tools used in machining brass, steel, aluminum and hardwood are indicated.

The next requirement is that the cutting edge of the tools must be keen and smooth. Tools prepared by grinding on medium or coarse-grained abrasive wheels are usually not satisfactory. The final grinding of the tools should be done with fine-grained wheels supplemented by stoning with a medium or fine grade carborundum stone. When stoning by hand, care must be used to see that no wire edges or burrs remain on the cutting edges. This is imperative if the best results are expected.

Tools for machining aluminum should have a front clearance of from 6° to 8°, and a side rake appreciably greater than is customary on tools for machining steel. Side rake angles of from 10° to 20° are recommended for general use.

### Re-Sharpening

A lathe tool of the type shown in Fig. 2, possesses a number of advantages not usually obtainable with the customary type of tool bit. This tool is readily re-sharpened by holding its shank in the chuck of a tool grinder or an engine lathe and grinding off the outside diameter until the desired keen edge is obtained. Such grinding should be followed by stoning as previously indicated. By rotating the tool bit in its holder, the angles of the cutting edge and side rake can be varied considerably to suit the needs of the work being done. Tools of this type are now obtainable in various sizes on the open market. Many of these tools however, differ from the one shown in that their cutting edge is straight instead of concave.

Tools similar to the one indicated in Fig. 2 can be ground from ordinary high speed steel, tool bit stock, but the amount of grinding required materially increases the cost of preparing the tool. When so prepared, it is also somewhat more difficult to maintain the proper cutting angles during re-sharpening than it is with the type just recommended. It is more economical to use properly shaped tool bits rather than those ground from square or rectangular stock.

### Chips Should Not Be Too Curly

Tools of the form indicated in Fig. 2 may be used for rough turning and finishing cuts, but when the same tool is used for both, it should be re-stoned before making the finish cut. In general, tools of this type produce continuous chips which, as shown in Fig. 3, are but slightly curled when the tools are functioning properly. Decreasing the top and side rake angles, that is, increasing the angle of the cutting edge of the tool, causes more curl in the chips, and tends to break them up. At the same time it increases the generation of heat, and thereby tends to decrease the life of the tool.

A lathe tool ground for machining brass produced the finish shown on specimen A, in Fig. 4, and during the machining, the tightly curled chips shown in Fig. 3 resulted. The specimen B, in Fig. 4, was machined with a tool properly ground for turning aluminum, giving the long chips shown in Fig. 3.

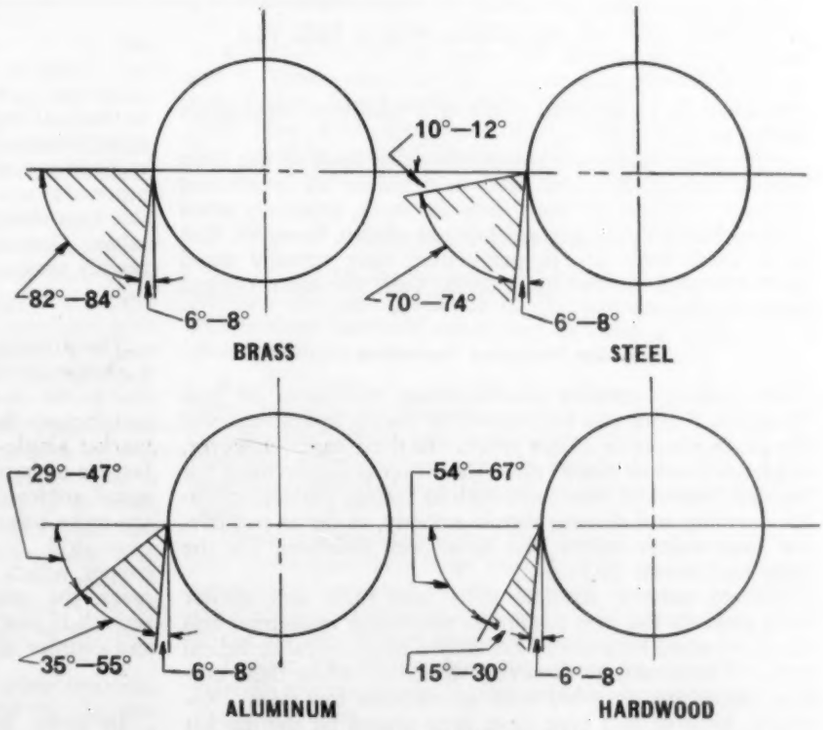



Fig. 1.—Ranges of Cutting Angles.

### Tungsten-Carbide Tools

While high speed steel has proved satisfactory for machining aluminum, yet certain alloys of aluminum, notably those containing silicon, can be machined more easily with the comparatively new tunsten-carbide tools. The use of such tools, in nowise detracts from the requirements just indicated for the proper cutting angles.

Of course, while the tungsten-carbide tools are much harder than those of high speed steel, they are also appreciably more brittle. For this reason, it becomes quite necessary to use these tools in machines that are free from lost motion or vibration, which might cause chattering. Care also must be used in the selection of the tool bit holder to insure that there is a minimum amount of spring in it.

The reader will readily appreciate that tools of the form shown in Fig. 2, when used in a holder of insufficient stiffness, will tend to "root" into the work, especially when making heavy cuts. Experience has shown, however, that when these tools are properly used they actually stand up better and remove more metal than the more rugged appearing tools.

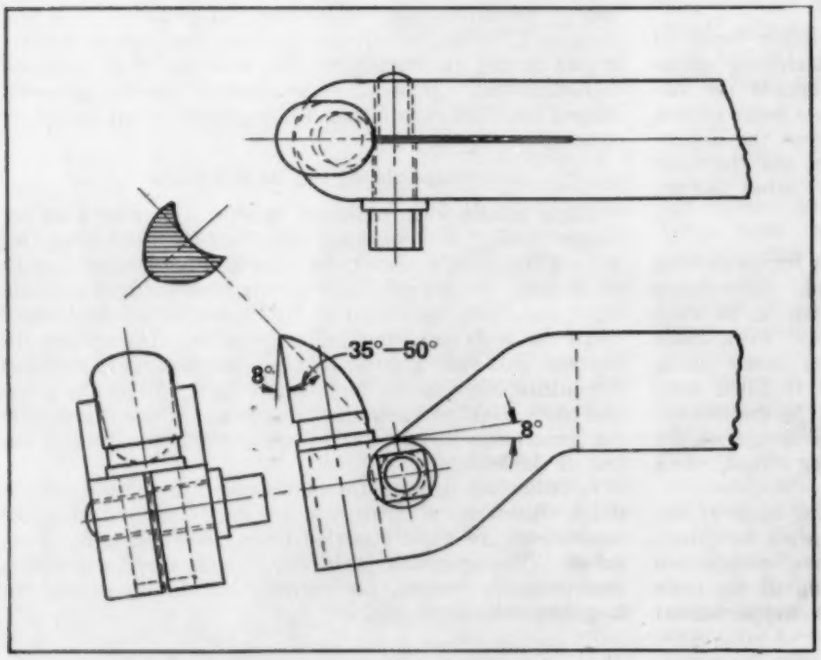



Fig. 2.—Good Type of Lathe Tool.

### Other Machining Operations

By making suitable modifications, the form of tool shown in Fig. 2, can be adapted to boring operations and for use in shaper or planer work. In these cases, however, emphasis must be placed upon the stiffness requirement for the tool holder. Other tools such as facing, parting, circular, forming and skiving should embody, as far as possible, the same requirements that have been indicated for the lathe tool shown in Fig. 2.

Milling cutters, straddle mills, end mills and similar tools produce the best results in machining aluminum and its alloys when they are of the coarse tooth spiral or helical type. These cutters, however, work best when their cutting edges are provided with appreciable top rake. Recently, tools of this type have been placed on the market for use in machining steel. Such tools work quite well on aluminum, but would give still better results if the angles of the top rake and side rake were increased.

The threading of aluminum parts can be readily accomplished by the use of spiral taps or taps of the "gun" type. The "gun" type of tap however, does not give best results when used as a bottom tap or for taper threads. In general, spiral fluted taps, such as shown in Fig. 5, will prove the most satisfactory for use in aluminum. Such taps, however, should be provided with top rakes on the back of the lands so that they will clear themselves when being backed out of the work. High speed steel taps with ground, relieved threads give best results.

Oversize taps are often used on aluminum, as they assist in maintaining the required dimensions. That is, aluminum, because of its lower modulus of elasticity, has more recoverance after tapping than steel. Thread chasers for automatic and semi-automatic die heads and for collapsible taps should be ground with considerable side and top rakes. Certain makes of these tools lend themselves more readily than others to this modification of cutting angles.

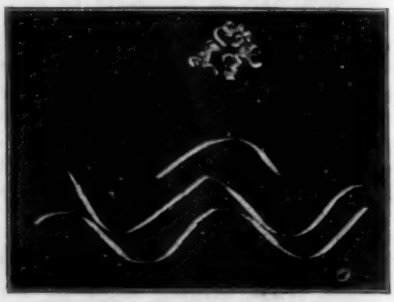
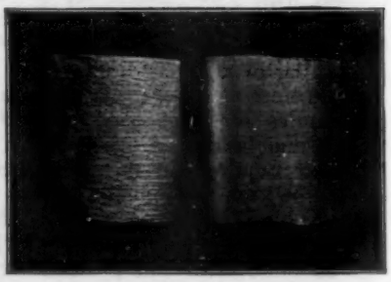


Fig. 3.—Continuous Chips



A B

Fig. 4.—A—Finish Produced by Brass Tool.
B—Finish Produced by a Properly Ground Tool.

### Ordinary Twist Drills Not Satisfactory

The drilling of aluminum and its alloys, while apparently a simple machining operation, often involves difficulties due to the fact that the ordinary twist drill is not entirely satisfactory for the purpose. There are available on the market single fluted twist drills such as used in the manufacture of hardwood furniture and two-fluted drills having spiral angles of about 47° instead of the usual 24°, which are more suitable for drilling aluminum than the ordinary twist drill. Special drills have been developed for drilling copper which also work very well on aluminum. In all cases, the cutting edges of the drills should be stoned smooth if best results are expected. Spiral fluted reamers and counter sinks give best results on aluminum.

### Chromium-Plated Tools

In some instances, chromium-plated tool bits, twist drills, files and saw blades have shown improvements over

similar tools not so plated. These advantages are apparently due to the low coefficient of friction existing between aluminum and chromium, with the result that the heat of both the tool and the work is kept down during the machining operation, and the cuttings do not stick so readily to the tools. The use of diamond tools is not recommended except in special cases, since the desired cutting angles of the tools cannot be maintained because of the brittleness of the diamond.

#### Use a Good Coolant

Undoubtedly, the best results in machining aluminum are obtained when using a suitable tool coolant. Cutting

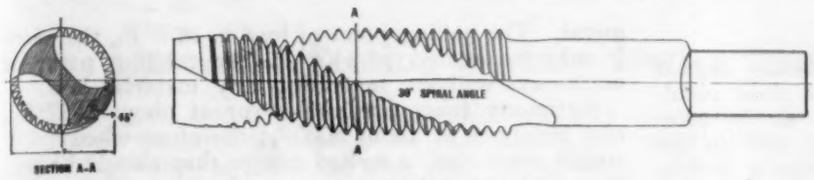



**Fig. 5.—Spiral Fluted Taps.**

compounds having a paraffin base such as are customarily used in machining brass are not at all satisfactory. In some instances, satisfactory results will be obtained by the use of a soluble cutting oil mixed with water.

As in the case of other metals, a continuous and copious supply of coolant should be provided. The coolant not only prevents the adherence of chips to the tool, but also affords a means for dissipating the heat generated during the cutting operation. In this way, it assists in the maintenance of the desired dimensions of the work. This is especially important when machining aluminum, because of its high coefficient of expansion as compared to steel or brass. Aluminum parts should be maintained at or about room temperature before the final machining operations are performed, in order that they will be made to the required dimensions.

#### Punching and Shearing

When punching or shearing aluminum, tools similar to those used in punching and shearing steel can be used, but, in the case of aluminum, greater clearances between the cutting edges of the tools should be provided. It is recommended that the clearance between cutting edges be one-eighth of the thickness of the material to be sheared or punched. This clearance is appreciably greater than customary, yet its use will insure smooth, sheared edges, free from burrs, but with a slight angle of about 6°.

Experience has shown that with proper attention to the points discussed rapid production together with high finish and accurate dimensions can be attained.

In conclusion a few don'ts may be appropriate.

DON'T try to machine aluminum with the same tools you use on other metals.

DON'T attempt to use springy tool holders for the thin-edged tool bits recommended.

DON'T squeeze the work too tightly in the chucks or clamps, as aluminum distorts more easily than steel, and, when removed from the machine, will be found to be off dimension.

DON'T expect to machine aluminum satisfactorily on machines having lots of lost motion in the cross slides.

DON'T overlook making suitable provision for taking care of the long continuous chips.

DON'T forget that a high grade coolant must be used if good finish, rapid production and accurate dimensions are desired.

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## Foundry Methods

Q.—I would like to get data on the following.

1. Suggestion on running German silver of the following: 60 Cu., 25 Zn., 15 N. What flux is best? Advise as to when to add zinc, the usual metal loss, and whatever else you may consider important.

2. Proper handling and running down bronze: 87 Cu., 11 Zn., 2 Sn., mixture. What flux is recommended? Gas fired Buckeye crucible furnace used.

3. Lost wax process.

In the foundry under my supervision I'm getting good results except for a slight defect in bronze and brass castings which shows on surface when highly polished and buffed, and would like to compare your suggestions with my practice to see if I can remedy the trouble. It shows on 50% of castings of the heavier kind but not on small gate work.

A.—In answer to your first question: We suggest the use of the oil or gas fired crucible furnace such as you have. First, place the nickel in the crucible. Use a little borax as a flux. When the nickel starts to melt, add the copper, a little at a time, until all the copper and nickel is melted, then add 4 oz. of 30% manganese copper. Stir well and then add the zinc. Stir the metal as the zinc is added and just before pouring add 4 oz. of aluminum to 100 lbs. metal as a flux to aid in the running.

2. Charge the copper and melt quickly, using charcoal, if possible, and if not, some old wood. Add the tin, stir, and then add the zinc a little at a time, stirring after each lot of zinc is added. Pour at approximately 2,000° F Add 1% of 50-copper-50 nickel as a flux.

3. Lost wax process: Much data has been published in THE METAL INDUSTRY from time to time by D. J. Lemal and S. Wein—much more than we can give here, so secure copies for March, 1906, August, 1911, January, 1908, May, 1909, December, 1921, and September, 1920. You possibly can find above copies in a Public Library.

—W. J. REARDON.

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## Die-Cast Duralumin

Q.—I would like to know if we could get very small pressure die castings made of Duralumin. Each would weigh about one-half ounce and be used as a part for a phonograph reproducer.

A.—It is entirely possible to pressure die-cast Duralumin, but it is not possible to give these die castings the regular Duralumin heat treatment. This is due to the fact that the high temperature required for Duralumin heat treatment develops blisters in the pressure die castings.

There is a possibility that Duralumin pressure die cast and water-quenched from the die will develop a certain amount of increased tensile strength as compared to the same alloy normally die-cast and allowed to cool in a pile in the air after being removed from the die.

To our knowledge, however, there has been no commercial attempt made in the past to do anything along the above lines.

—SAM TOUR.

# White Metals, Brasses and Bronzes

## A Series of Articles Describing the Types, Constituents, Properties and Methods of Making a Wide Variety of Mixtures as Practiced in a Large Casting Plant—Part 4*

By E. PERRY
Consulting Chemist, Oakland, Cal.

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

### Melting a Charge

BRASS, bronze, babbitt and white metals depend upon their chemical composition for their peculiar physical properties, color, etc., so in making a mix it is essential that each metal used in the alloy be accurately weighed. In making a 100-lb. mix the common metals copper, tin, lead, and zinc should be weighed to within an ounce; in the case of scrap a variation of 4 ounces will make little difference, but in a formula calling for bismuth, arsenic, phosphor-tin, etc., the weighing must be extremely close. After the metals have been weighed they are to be charged, i.e.—put into the crucible. Using a No. 60 plumbago crucible which has a capacity of about 180 pounds, the proper charge of metal would be 150 pounds. Usually the charges are figured at 100 lbs., in which case every pound of material represents 1 per cent. When the charge is made up entirely of new metal with no sprue present it is termed a "virgin mix"; with new metal and sprue it is called a "new-metal mix"; and with a small amount of new metal mixed with a large amount of sprue and borings it is called a "scrap mix." An "all scrap mix" is one containing sprue, borings, etc., and no new metal. All of the mixtures require a "cover" to prevent oxidation and volatilization, but it is not necessary to use a "flux" only in the case of impure or dirty material.

The order of charging the metals in the crucible is as follows: Charge the copper and other high-melting point metals first; follow with the non-volatile low-melting point metals—tin, lead, etc.; and when these are melted add the volatile metals—arsenic, phosphorus, zinc and bismuth. Of course there are exceptions to this rule, but in general it may be followed with safety.

By studying the melting and boiling points of the metals the operation can be conducted intelligently; for instance, in making a scrap bronze mixture the copper (melting point-1949°F.) would be melted first; the phosphor-bronze sprue (m.p. 1690°F.) would melt in the molten copper and lower the temperature to this point; lead with a melting point of 621°F., and tin melting at 451°F. would follow in the order named. Sometimes it is necessary to make a mixture in which two of the metals do not alloy freely; for instance copper and lead, with tin as the third metal. Copper alloys perfectly with tin, and so does lead, therefore in such a case the copper is melted first and then the tin added, after which the alloy will take the lead. Again, where two metals have an affinity for each other and alloy freely as in the case of lead and antimony, the non-volatile metal, even if it has a lower melting point, should be melted first and the heat then raised to the melting point of the volatile metal. The boiling point of lead is 2876°F., therefore it may be heated to 1160°F., the melting point of antimony, without sustaining any material loss.

Antimony takes fire and burns at about 1652°F.; zinc sublimes at about 800°F.; therefore when these metals are added to melted copper they should be put in a little at a time so as gradually to lower the heat of fusion while they are forming an alloy with the copper. In any event there is always more or less loss. All of the metals are subject to a slight loss by oxidation or volatilization during the melting process, the loss varying with the degree of temperature and to the length of time the molten metal is exposed to the air. Approximately, brass loses from 2 to 3 per cent in melting; copper and lead lose very little by oxidation; while the loss of tin in melting is figured at about one-half of one per cent. Antimony is supposed to lose anywhere from one to ten per cent, and zinc is said to average a loss of about five per cent in melting.

### Standard Alloys

Common yellow brass is an alloy of copper and zinc, the standard mixture being composed of two parts of copper and one part of zinc by weight. By changing the proportions of copper and zinc, and by introducing a small quantity of aluminum, lead, tin, phosphorus, etc., a great many varieties of yellow brass possessing marked physical characteristics may be obtained. In melting the mixture, the copper is generally melted first and the zinc put in afterwards. Usually the molten copper is covered with charcoal, then part of the zinc added and allowed to melt, after which the remaining zinc is introduced. Zinc in contact with air sublimes at a temperature of about 800°F. and burns to oxide, consequently it should be added to the molten copper in the crucible in small portions at first to reduce the heat, the melting point of copper being about 1949°F.

### Scrap Mixtures

In the regular routine of brass making it is customary to use up all of the gates, sprues, etc., made each day; otherwise these would lead to large accumulations of material and an actual monetary loss. In remelting such mixtures there is usually a loss of both copper and zinc, also a change of color in the alloy. If the alloy is red in color or is too soft, more zinc must be added; if hard and pale-yellow in color, more copper is needed in the mixture. Mixtures containing borings and foreign scrap usually produce defective castings, unless the metal is freed from oxide and other impurities.

To remove oxides and insure sound castings, nothing else accomplishes this quite so well as phosphorus, and either phosphor-copper or phosphor-tin

*Parts 1 to 3 appeared in the issues of September, November and December, 1929, respectively.

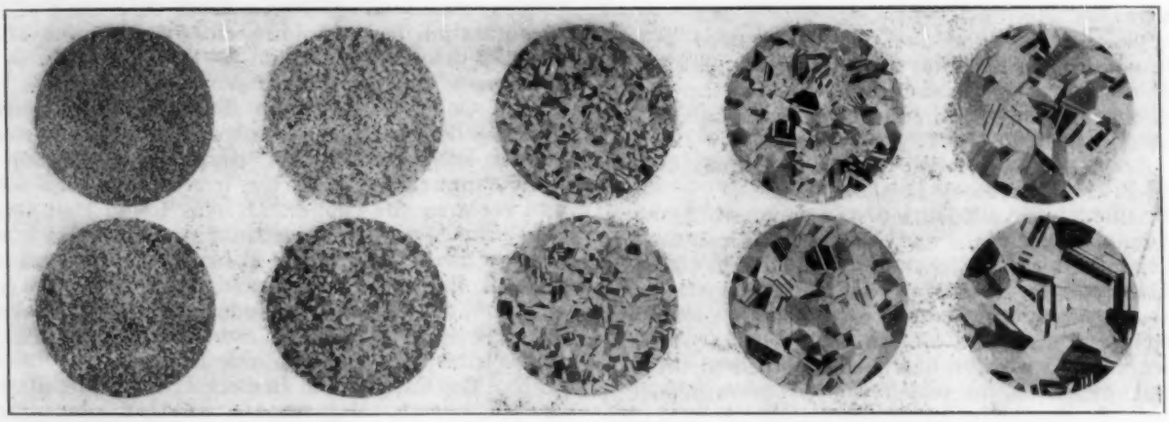
may be used as a deoxidizing agent. Phosphor-tin hardens the brass; therefore, unless a certain degree of hardness is desired it is better to use phosphor-copper. Using the 12.50 per cent phosphor-copper, 2 ounces of the deoxidizer will be sufficient for 100 pounds of brass. It should be added in small pieces and the mixture well stirred just previous to pouring, allowing about two minutes for the phosphorus to act on the metal. Brass borings containing iron, even if cleaned in a magnetic separator, retain a notable amount of iron dust, and this must be removed in the melting process as otherwise the castings will be extremely hard. "Iron Fiend" flux previously described is generally useful for removing iron, and from 1 to 4 ounces of the flux in the bottom of the crucible is sufficient to eliminate the iron as iron oxide in 100 pounds of the alloy. The iron oxide with the other impurities rises to the top and is to be skimmed off. After skimming, the metal may then be treated with 1 or 2 ounces of phosphor-copper to further purify the metal.

**This series will be continued in an early issue.—Ed.**

# Materials Testing Society Issues Standard Micrographs

THE American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Po., has issued for general distribution at a nominal price a set of standard micrographs which have gained considerable interest particularly non-ferrous alloys, such as brass, bronze and nickel silver.

The original reproduction of the photo-micrographs as issued by the Society show them in 75 diameter



Upper—0.010 mm. average grain diameter. Lower—0.015 mm. average grain diameter.

Upper—0.025 mm. average grain diameter. Lower—0.035 mm. average grain diameter.

Upper—0.045 mm. average grain diameter. Lower—0.065 mm. average grain diameter.

Upper—0.090 mm. average grain diameter. Lower—0.120 mm. average grain diameter.

Upper—0.150 mm. average grain diameter. Lower—0.200 mm. average grain diameter.

from metallurgists and others interested in the subject. The set, as here reproduced, was prepared by Committee E-4 for its report on grain size standards. It contains ten micrographs, which are standards for the estimation of the diameter of average grain of annealed materials, enlargement, being micrographs of 70-30 copper-zinc alloy, etched by ammonia and hydrogen peroxide. The set is obtainable from the Secretary of the American Society for Testing Materials, who may be addressed as stated above.

## Non-Corrosive Soldering Flux

Q.—We would appreciate your giving us some information as to how we can do a soldering job with a non-corrosive soldering flux. We solder tubes, and the method used is to place them against a revolving wheel which conveys solder to the tube. The chief trouble with the non-corrosive flux we are experimenting with is that it makes the solder sluggish and does not allow it to flow freely into the perforation provided to allow solder to flow into inside tin.

We use all clean tin in manufacturing these tubes, but in using the non-corrosive flux, the wheel seems to get dirty and the flux also does something to our solder which makes it sluggish.

We are forwarding a piece of tube showing the kind of a soldering job necessary for us to get. This job was done with an acid soldering flux.

A.—Your trouble may be due to excessive antimony.

A small percentage of phosphorus renders soft solder very "lively," that is, the solder has a tendency to run freely. Too much phosphorus is injurious, and if added to thin the solder, it should be in the form of phosphor tin. One or two ounces of five per cent phosphor tin to 100 pounds of solder is generally sufficient. As you have not given us the formula of the flux or stated if it is in liquid, paste or powder form, we are enclosing a small sample of solder and flux combined non-corrosive. There are fluxes put up in paste form for use on electrical parts which give good results.

Antimony is an objectionable impurity in soft solders as it renders them less fluid. Zinc also has an injurious effect on soft solder, causing it to flow sluggishly.

—P. W. Blair.

# The Protective Value of Chromium Plating

## A Progress Report on the Work Done Through the Research Fund of the American Electroplaters' Society

By W. P. BARROWS

Research Associate of the American Electroplaters' Society at the Bureau of Standards

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, DECEMBER, 1929

### I—Introduction

At a recent meeting of the Research Committee of the American Electroplaters' Society, it was decided that the principal subject for their research should be the protective value of chromium plating. Since that time the general scope of the problem has been outlined, and progress has been made upon the first phase of the investigation.

**The entire research** will include:

1. A study of methods of measuring the porosity of chromium coatings.
2. The effects upon the porosity caused by different conditions used in the chromium plating, by the thickness of the chromium, and by the use of one or more layers of other metals such as nickel and copper prior to the chromium coating.
3. Accelerated corrosion tests such as may be conducted in the laboratory in short periods.
4. Atmospheric exposure tests. Some of these will be made in the locations used by the American Society for Testing Materials in their tests now in progress on coated metals. Tests will be made upon iron and steel, and upon the non-ferrous metals, including copper, zinc, brass and aluminum.

Thus far the research has been confined to the first of these problems, to which this progress report is devoted. It should be emphasized that no final conclusions or recommendations regarding the porosity of protective value of chromium coatings are warranted from the following results, which refer simply to methods of testing.

### II—Methods of Detecting Porosity

The results of experience and of published researches show that chromium coatings with the commonly used thickness are porous, and that the chromium does not exert any protective value such as zinc does on steel against the corrosion of the base metal exposed through pores. It is obvious therefore that any improvement in the quality of chromium plated products must depend upon a reduction of the porosity of the chromium or of the intermediate coating applied between the base metal and the chromium. In order to determine whether such an improvement is effected by any given procedure, it is necessary to have reliable methods for detecting the porosity and evaluating its extent. The following methods were investigated:

1. With Chemical Reagents. The most generally used method of detecting porosity in a metal coating is to treat the surface with some reagent which will have little or no effect upon the coating, but will attack the base metal that may be exposed through the pores and will give some visual evidence of the attack at those points.

(a) **On Iron.** (1) **Ferroxyl Test.** The most common example of such a test is the well-known ferroxyl test, which has been applied in various forms to detect porosity of coatings of metals such as copper, lead, tin and nickel on iron and steel. The reagent contains some corrosive compound, usually sodium chloride, to attack the iron, and a ferricyanide to produce a blue color with the ferrous salt thus formed. The test is not applicable to coatings of zinc and cadmium, which are attacked by sodium chloride more readily than is iron. As chromium is usually "passive," i.e., is more noble than the iron, the test can be used to detect porosity of chromium coatings upon iron or steel. It was found that a solution containing merely 10 g/L of sodium chloride and 1 g/L of potassium ferricyanide yielded in 30 minutes more sharply defined blue spots or lines than when agar, commonly used in this reagent, was present.

(2) **Copper Immersion Test.** When a piece of ordinary iron or steel is introduced into an acidified copper sulphate solution, copper is deposited upon it by "immersion," i.e., the iron passes into solution and replaces the copper. It was found that this test can be used to detect porosity in chromium coatings applied directly to steel. When the chromium plated piece is immersed in an acidified solution of copper sulphate, sharply defined red spots and lines are produced within 30 minutes wherever there are pores in the chromium.

(b) **On Copper and Brass.** It has been shown by various authors that the ferroxyl reagent produces red spots where copper is exposed. As, however, the red color is due to the formation of cupric ferrocyanide it is more logical to use a ferrocyanide than to depend on the reduction of ferricyanide. Dilute nitric acid acts rapidly on copper, but does not attack chromium. A reagent was therefore prepared consisting of 1 part by volume of concentrated nitric acid and 9 parts of water, and 2 g/L of potassium ferrocyanide. In this concentration of nitric acid there is very little oxidation of the ferrocyanide. This reagent produces sharply defined red spots or lines within 15 minutes wherever copper or brass is exposed.

(c) **On Nickel.** It was not found possible to develop any reagent which will attack nickel rapidly and not affect chromium. A solution containing equal volumes of concentrated ammonium hydroxide and water and 2 g/L of dimethyl glyoxime slowly produces pink spots or lines on chromium plated nickel wherever the nickel is exposed. As, however, it requires from 12 to 24 hours for the color to appear, the method is not satisfactory for inspection. Pending the development of a more satisfactory reagent, this procedure was used by us for comparison with the copper deposition method.

By Copper Deposition. It was found independently by Dubpernell and by Kryopolous that copper does not readily deposit from an acid sulphate solution upon chromium. This fact was used by Baker and Pinner and by Baker and Rente as the basis of a test for the porosity of chromium coatings. They found that when a chromium plated surface is made the

cathode in an acid copper solution, copper deposits only upon those points where there are pores of cracks in the chromium. This method was used by the above authors for determining the relative porosity of coatings produced under different conditions.

It was found in our experiments that copper can be deposited upon a piece of electrolytic chromium, but that a higher voltage is required to do so than to deposit copper on other metals. In order to insure that the copper is deposited only upon exposed base metal and not upon the chromium, it is preferable to control the applied voltage in the copper deposition, rather than the current density as was done by the above authors. At best the actual current density is indefinite, as the area upon which the copper is precipitated is not known. It was found that sharply defined copper deposits are produced in two minutes at the pores in the chromium when a potential of 0.1 to 0.2 volt is applied between a copper anode and a chromium plated cathode 5 cm. (2 in.) apart, in a solution containing approximately 200 g/L of copper sulphate and 75 g/L of sulphuric acid. In subsequent tests a potential of 0.2 volt was applied under the above conditions.

That the copper is actually deposited on the base metal and not on the chromium, was shown by subsequently dissolving the chromium in dilute hydrochloric acid. The deposited copper could then be seen adhering to the base metal in the original pattern.

### III—Comparison of Methods

Simply in order to determine whether the above methods yield comparable results for porosity, tests were made with deposits of chromium of three thicknesses, viz., 0.0005 mm. (0.00002″); 0.001 mm. (0.00004″); and 0.005 mm. (0.0002″). The first two represent the range of thin deposits such as are commonly applied over nickel on automobile and plumbing fixtures; and the latter represents a relatively thick deposit such as is sometimes applied directly to brass fixtures. All deposits were made in a solution containing 250 g/L (33 oz./gal.) of chromic acid and 2.5 g/L (0.33 oz./gal.) of sulphuric acid, at 45° C. (113° F.). On steel and nickel a current density of 10 amp./dm.² (100 amp./sq. ft.) was used, and on copper and brass a current density of 20 amp./dm.² (200 amp./sq. ft.). The chromium was deposited in each case directly on the base metal. The following tests were made immediately after deposition.

Tests were made with copper deposition upon all these types of plate; and also by the reagents above specified for each base metal. The examinations were made with a microscope, at a magnification of about 60. It was found that for each base metal and thickness of deposit, the results by the two methods of test were in close agreement. In the thinnest deposits, round pores were observed. In the slightly thicker deposits cracks appeared which, especially on copper and brass, were usually parallel to each other and perpendicular to the direction of the last polishing. In the thick deposits the cracks were in clusters, radiating from centers, and showed no preferred orientation. The tests showed clearly that the copper deposition method, when applied as above described, gives a true indication of the nature and extent of the pores and cracks in the chromium coatings. As it is applicable to all base metals, it is more generally useful than any of the other methods.

The next problem to be studied will be the effect upon the type and extent of the porosity caused by variations in the conditions of chromium deposition; by the presence of different preliminary metal coatings; and by standing for short or long periods under different conditions. In this connection efforts will be made to evaluate the relative areas of base metal exposed; and to devise methods for determining the extent to which the pores or cracks extend through the successive layers of composite coatings.

# Polishing Stainless Steels

By T. C. EICHSTAEDT
Detroit, Mich.

FIFTY years ago the finishing trade did not know very much about the proper application of nickel plating, which at that time caused as much excitement and furor as the application of chromium plating is causing at the present time.

The necessity then was the development of polishing equipment to produce that mirror-like lustre on nickel plated articles. No one seems to know what kind of polishing wheels, abrasives, glue, speed or pressure to use, or many of the other essentials for proper and economical polishing. All of these methods are now well established and have seen great improvements especially since chromium plating has come into general use.

Through the steadily increasing demand for a metal with a lustre that will not tarnish or rust or discolor, without being electroplated, there have been and still are being developed quite a few steel, iron and chromium alloys. Through the steadily increasing use of these rustless chrome-iron alloys which in 60 per cent are finished to their well-known everlasting lustre, it has been found necessary to develop new and different methods for polishing and buffing these materials.

A few of the most essential points are herewith mentioned. Polishing speeds up to 10,000 ft. per minute and buffing speeds up to 15,000 ft. per minute should be applied. A high quality hide glue and Turkish emery is necessary to produce the best results. The buffing compounds used should contain a large per cent of chromic oxide. And of still more importance than any point mentioned above is the fact that the polishing and buffing wheels must be kept absolutely clean, and cannot be used for polishing any other metal or alloy. This is imperative, due to the danger of the wheels forcing small particles of other metals into the surface of the material which might cause electrolytic corrosion. Also, the wheels, if used for polishing metals that are to be plated, may be contaminated or impregnated with small particles of the alloys, in which case it would be impossible to get a perfect electro-deposit on these.

The automatic polishing machine has greatly helped progress in the finishing of chrome alloys during the past few years; and especially during the last twelve months, on alloy of all kinds. The fact is that higher speed and greater pressure are necessary and that the automatic polishing machines can be very successfully designed to combine these much better than hand polishing for any articles that can be handled on automatic machines. But on strip and sheet metal the polishing and buffing are generally done before the cutting and the automatic machine is here indispensable. It has been proved that costs have been reduced to 10 per cent of the hand polishing while at the same time a much better and more uniform finish has been obtained. And the end is not yet reached. Improvements are still being made.

# Electrodeposition of Iron

## Experiments with Different Baths. Hot Concentrated Sulphate Solutions Worked Well

By T. P. THOMAS
Pittsburgh, Pa.

FROM THE MONTHLY REVIEW OF THE AMERICAN ELECTROPLATERS' SOCIETY, DECEMBER, 1929

FROM the first recorded deposition of iron in 1846 to the present day, the electrolysis of iron solutions has been the subject of many investigations. The object for which the electro-deposit is required must be considered when selecting the type of bath to employ. One that would do well for steel-facing might be quite unsuitable for refining.

A careful consideration of the numerous solutions proposed brings about the following classification: (1) Those based on the use of sulphate of iron; (2) those based on the chloride, and (3) those containing both sulphate and chloride.

The chloride bath has advantages over the sulphate solution in the following respects: (1) It can be made more concentrated and hence will contain more metal; (2) it is a better conductor of the current; hence lower voltage is required; and (3) in general the rate at which the chloride bath can be worked is greater than in the case of the sulphate solution.

The sulphate bath is preferable in the following respects: (1) It can, if necessary, be worked cold (25° C.) whereas the chloride baths require a much higher temperature; (2) the oxidation of the solution is less, and (3) the deposits oxidize very much less quickly than do the deposits from the chloride baths.

The great objection to mixed electrolytes is the difficulty of control, especially on the anode side of the bath.

During the late war, the British army repair shops were confronted with the problem of repair or replacement of enormous numbers of worn parts of automotive machinery, and decided to attempt the salvage of many of the simpler parts by the electrodeposition of iron.[1] The method described was that using a cold ferrous ammonium sulphate bath at low current density. Since it was used successfully in commercial work for the production of about 6000 repaired parts, experiments along the same line were started at the Westinghouse Research Laboratory. The apparatus used was essentially that described in the article mentioned except that the current used for cleaning was obtained from a 0.75 Kw., 60 Volt generator, direct connected to an induction motor; while the plating current was taken from storage batteries at any desired voltage. The anodes of 0.036 in. Armco iron made into cylinders, were hung on a wooden rocker frame driven by a wooden connecting rod directly connected to a small reducing gear. The solution used in the British Work, 75 gm. of ferrous ammonium sulphate per liter, was tried, using the current density recommended: namely 0.33 amperes per sq. dm. Under these conditions the deposit on a cold-rolled steel sample was smooth, bright, and adherent; it withstood bending and refused to chip off even when attacked at the junction of coating and parent metal with a cold chisel. A current efficiency of about 75 per cent was obtained, the rate of deposit being about 0.0002 in. per hour.

Baths thus prepared had an H ion concentration of $10^{-5}$ (pH=5). They were rather uncertain in their behavior, being especially likely to oxidize when used with small pieces. Adding ferrous-carbonate "mud" reduced this tendency to oxidize, and the baths which were worked steadily maintained a pH of 6. Powdered charcoal helped to secure a good deposit, and was used in all subsequent work. Various addition agents, such as boric acid, tartaric acid, ammonium tartrate, etc., were tried in an effort to obtain a consistently smooth adherent deposit, but gave unsatisfactory results. During this period of the work, it was found that additions of ferric iron resulted in either a hard brittle coating, similar to that sometimes obtained when the acidity was too high, or no coating at all, and that satisfactory deposition did not take place until all the ferric iron had been reduced to the ferrous state.

This preliminary work established a definite set of rules of procedure by which we could be certain of a good deposit. After most of the grease had been removed from the piece to be plated, and the portions on which no deposit was desired had been covered with a mixture of 90 per cent hydroline (M. P. 100° C.) and ten per cent paraffine, it was made the cathode for three minutes in a ten per cent solution of commercial lye and salsoda in equal proportions. A current density of three to five amperes per sq. in. was used in this portion of the cleaning. The piece was then washed in running water and made the anode for an equal time in thirty per cent commercial sulphuric acid, using about the same current density. In the acid cleaning bath, it is important to have the current density sufficiently high so that the iron becomes passive and gases freely. If too low current density is used, the piece is attacked by the acid and cleaning does not take place. With sufficient current to produce passivity, as indicated by free gassing of the work, the piece comes from the acid cleaning bath with a beautiful pearly lustre, and upon washing in running water and transferring to the plating bath without touching in any way the cleaned portion or allowing it to dry, a satisfactory coating is obtained. While the work is in the acid cleaning bath, any motion of the work will sometimes result in a decrease in current and cessation of gassing of the work, showing that it has become active, i. e., is being attacked by the acid. When this tendency is very pronounced, it is an indication that the current density is too low. After cleaning in this manner and transferring immediately to the plating bath we found it possible to produce satisfactory coatings at the rate of 0.0006 in. per hour, corresponding to a current density of one amp. per sq. dm., which is three times the rate attained in the British work.

The dilute plating bath used at room temperature and with low current density produced a coating that was satisfactory for most purposes, but was rather difficult to machine. The most serious drawbacks to this method were the slow rate of deposit and the tendency to produce pitted deposits, which always resulted if the anode area was not sufficiently large in proportion to the cathode area and the exposed surface of the solution.

The next line of attack was in the field of hot concentrated baths operated at high current densities. A paper

[1] B. H. Thomas, Automotive Industries, Aug. 26, 1920.

by W. A. Macfayden[2] gave complete data on the use of a bath with 300 gm. of ferrous ammonium sulphate per liter, worked at 50 to 75 degrees C. All of Macfayden's work was done with still solutions, but as our work with cold baths had indicated the value of ferrous-carbonate mud and charcoal, which necessitated stirring, we combined the two methods. The deposits obtained, using a current density of seven amperes per sq. dm., were softer than those from the cold baths, perfectly adherent and of a velvety appearance. This method gave a greater increase in the rate of deposit, as the current efficiency increased to practically 100 per cent. In the hot concentrated bath, anode corrosion is so complete that oxidation is negligible. The addition of ferrous carbonate mud is practiced, but the amount used is very small. These baths may be left for weeks, when not in use, without any serious oxidation. They have been used continuously during the daytime for weeks without deteriorating. Another advantage of the hot bath is that so high a rate of deposit (0.004 to 0.005 in. per hr.) may be used that practically any salvage job can be done in one working day.

In order to test fully the working qualities of deposits produced by these methods, we have built up worn or undersized parts of many kinds, which have then been put in service. These run all the way from the badly scored bearing of a 1/20 h. p. motor shaft to an experimental aeroplane propellor hub, including both the bearing and pinion fit on a street railway motor shaft. Plug and thread gages have been repaired and have given good satisfaction, although they are not as hard as heat-treated tool steel. It is, of course, possible to carburize such pieces, when they will compare favorably with the original gages. One of our prize exhibits is the shaft from a three h. p. motor which was used on a six spindle drill press with a rather short, very tight belt. This shaft was ground undersize to simulate wear, then plated with the hot bath method, ground and reassembled. It ran steadily on the day shift for eight months and was then taken out for inspection. No wear could be detected, either by micrometer or appearance. As this shaft had had about a thousand hours of actual service it is quite evident that this material is all that can be desired for bearing service. The press fit tests, severe bending, and forging pieces with coatings 1/16 in. or more thick, all indicate that platings produced in this manner are perfectly anchored to the parent metal.

#### Discussion

QUESTION: I would like to ask if there is any trouble with the anode corroding.

MR. THOMAS: No trouble at all. We had complete anode corrosion, so that the composition of our bath or solution remained practically constant. No additions of iron salts were necessary to the bath.

MR. SNYDER: I would like to ask Mr. Thomas, in the use of this iron in the hot solution, if there was a formation of a black sludge on the iron, and if there was a tendency of this sludge to become suspended in solution and thereby cause a roughness in the deposit in any way.

MR. THOMAS: That is, in the hot bath?

MR. SNYDER: Yes.

MR. THOMAS: I can't say that there was. Possibly in the cold we did have some covering of probably a scum at the anode, but neither in the cold nor the warm did we find the presence of that. But in both of them we found the presence of the powdered charcoal seems to take us away from any difficulty of that kind.

MR. W. M. PHILLIPS: Does the deposit contain any carbon?

MR. THOMAS: I will admit that we have not so far analyzed our deposits, although we have taken microscopic pictures or slides of the deposits, cross-sections, and have not noticed the presence of carbon.

DR. A. K. GRAHAM: In using the carbon, I should think the form in which it was added would have an effect on the results obtained. For instance, much finely suspended matter in the solution might seriously interfere with the deposit. On the other hand, if the carbon were activated, it might have a decided value in cutting down any polarization. As I understand it, in iron deposition, there is a tendency for the hydrogen deposited at the cathode to cause trouble, and as far as the anode is concerned, I believe that the black scum which might form there would be associated with oxidation. If the gas evolution of both electrodes is reduced by the addition of carbon, it evidently acts as a depolarizer, and this action would undoubtedly depend upon the form in which the carbon was added. I would like to know what form of carbon was used and just how you got it.

MR. THOMAS: We added powdered wood charcoal, of a fineness that would go through about a No. 10 mesh —not far from that, that is just a guess. We just powdered it up in the most convenient receptacle we had at hand. We really didn't pass it through a mesh, through a sieve, but it was as fine as you could powder it with mortar and pestle. That was the grade of charcoal we added, ordinary wood charcoal. The presence of that charcoal in the bath certainly aided us very much.

MR. HOGABOOM: May I ask what percentage of the oxide of iron that may be in the solution that floats over through decomposition would you attribute to the formation due to the attack of the carbon dioxide and monoxide of the air on the solution? And then the evolution of gases; does not that probably form a blanket to prevent that?

MR. THOMAS: Possibly, when the bath is standing idle. I hadn't had that idea brought to me before; but during the operation of the bath, I question whether you would run into any difficulty of that nature.

MR. WEINMAN: Does any variation in the different types of original metallic composition of your tools make any difference in your deposition of metal? You take an alloy steel, for instance, and a plain ordinary carbon steel.

MR. THOMAS: No difference as far as results obtained. That is, we were able to obtain a satisfactory plate on cast iron, just as satisfactory as on, say, cold rolled steel, or possibly alloy steel.

[2] Trans. Faraday Society, 1920, Vol. XV, 98.

## Reducing Tri-Valent Chromium

Q.—On page 488 of your October, 1929, issue you mention porous pot method of reducing the tri-valent chromium. Will you please advise in what previous issue, or in what book, we can learn accurately about the porous pot method?

A.—The porous pot method of reducing the tri-valent content of a chromium solution consists of suspending a porous pot from the cathode rod and filling it with a chromic acid solution made by dissolving 2 pounds of chromic acid in 1 gallon of water. Suspend within this porous pot a strip of lead having contact with the cathode rod. Use the highest voltage possible. When chromium is deposited on the lead strip, the solution in the porous pot should be discarded and a new supply of solution poured in.

A convenient size of porous pot for this work is one 6 inches in diameter and 9 inches deep.

—Oliver J. Sizelove.

# Chromium Plating Costs

## How to Figure the Cost of Plating Chromium on Automobile Radiator Shells

By RICHARD SCHNEIDEWIND
Electrochemist

ABSTRACTED FROM COMMERCIAL CHROMIUM PLATING, CIRCULAR SERIES NO. 3 OF THE DEPARTMENT OF ENGINEERING RESEARCH UNIVERSITY OF MICHIGAN, ANN ARBOR, MICH.

THE commercial desirability of any article can always be measured by the demand for it at a price for which it can be made profitably as compared with the demand for a similar article, perhaps superior or inferior, at another price. Favorable comment and good salesmanship can sometimes create an abnormal demand, but in the long run the desirability and the price will guide the buyer. The costs in producing a chromium-plated finish must, in consequence, be a matter of great importance not only to the actual plater but also to the purchaser of the finished material. In general, it can be said that chromium plating is not very expensive when considered in the light of its many advantages. Because for purposes of decoration and corrosion resistance it is applied over the usual nickel plate, chromium is necessarily an added expense. The average job shop will finish the average piece with chromium for about 15 per cent more money than for an equivalent nickel finish. Actual additional cost is under this figure, but losses due to extra handling, accidental spoilage and refinishing defective work make up the difference.

Too much generalizing on costs is liable to prove misleading and therefore, a typical costs analysis will be given covering the cost of refinishing an automobile radiator shell. The shell under consideration has an area of approximately eight square feet, is made of only a fair grade of steel called by metal polishers "stove-pipe metal" because some lots are apt to contain deep pits. A portion of this piece was to have a dull finish, thereby necessitating a shield when buffing.

Let it be assumed that the shell is roughed out with 120 emery, polished with 150 emery, oiled out with 180 emery and inspected. It is then cleaned electrolytically in an alkaline metal cleaner for 90 seconds at 25 amperes per square foot, given an acid dip, and copper plated in a cyanide bath at 90° F. at 15 amperes per square foot for 20 minutes. It is copper buffed, inspected, cleaned in a similar manner, and given an acid dip; and nickel plated for 30 minutes at 10 amperes per square foot. After nickel buffing, it is inspected, racked, cleaned, dipped in acid, and plated with chromium for 3 minutes at 900 amperes per shell at 110° F. and given a final inspection. About 5 to 10 per cent require buffing after chromium plating.

Polishing and buffing labor was figured at $1.20 per hour; plating labor at $0.60; power at 1½ cents per kilowatt hour.

The overall electrical efficiency was computed at 80 per cent; the cyanide copper cathode current efficiency at 85 per cent; nickel at 95 per cent; and chromium at 12 per cent. The spray and drag-out for chromic acid were computed at 200 per cent of that used up in plating. The amount of steam necessary was calculated by heat transfer methods assuming a 60 per cent heating efficiency and oil fuel at 10 cents per gallon. Materials are at average market prices for 1929.

The cost analysis on the basis of a daily production of no less than 300 pieces per day is given in the following table:

COST ANALYSIS FOR CHROMIUM PLATING ON AN AUTOMOBILE RADIATOR SHELL

| | | |
|---|---|---|
| 1. Polishing and buffing | | |
| Polishing, labor for 3 operations | 30 to 40c | |
| Copper buffing, labor | 12 to 14 | |
| Nickel buffing, labor | 7 to 8 | |
| Chrome buffing, labor | 7 to 8 | |
| Materials | 4.5 to 6 | |
| Total | 60.5 to 76c | |
| 2. Copper Plating | | |
| Labor | 3.3c | |
| Plating Power | .5 | |
| Fan power | .2 | |
| Cleaner | .4 | |
| Acid | .3 | |
| Copper (including drag-out) | 4.1 | |
| Water | .1 | |
| Steam | 1.5 | |
| Total | 10.4c | |
| 3. Nickel Plating | | |
| Labor | 3.7c | |
| Power | .5 | |
| Cleaner | .4 | |
| Acid | .3 | |
| Nickel (including drag-out) | 4.6 | |
| Water | .1 | |
| Steam | 1.3 | |
| Total | 10.9c | |
| 4. Chromium Plating | | |
| Labor | 6.5c | |
| Plating Power | .9 | |
| Fan power | .3 | |
| Cleaner | .4 | |
| Acid | .3 | |
| Chromium (including spray and drag-out) | .6 | |
| Water | .1 | |
| Steam | 1.6 | |
| Total | 10.7c | |
| 5. Other Direct Expenses | | |
| Inspection and packing | 8.0c | |
| Trucking | .2 | |
| Supervision | 8.0 | |
| Miscellaneous Materials (racks, brushes, etc.) | .1 | |
| Packing material | .7 | |
| Maintenance | 4.0 | |
| Total | 21.0c | |

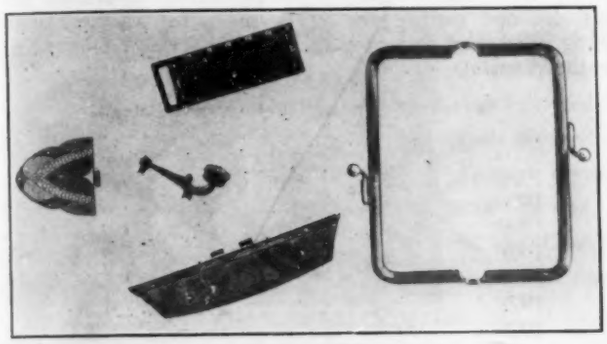
Total finishing costs: $1.135 to $1.29

These figures which apply to decorative plating do not include the expense of management, sales, depreciation of equipment and buildings, taxes, insurance and interest on investment which will bring the cost around $1.90. This is somewhat reduced if a large portion of the chrome plate needs no buffing, but it is increased by the costs of refinishing spoiled work. To refinish a spoiled shell by stripping, oiling out and replating will add about 80 cents to the total cost. These figures naturally do not include the expense of any non-standard operation such as touching up badly pitted areas in the steel. Some manufacturers include an initial alkali cleaning and pickling before polishing.

# Making a Safety Record in a Metal Working Plant

## C. W. Hardy Shows How Accidents Were Practically Eliminated at the Quigan Factory Which Won Three Safety Contests—Material Gain in Employee Welfare as Well as Large Reduction in Costs Effected Thereby

FRANK J. QUIGAN, INC., operate a plant at 65 to 85 Roebling Street, Brooklyn, N. Y., where metal frames for ladies' handbags are manufactured. The company employs in the neighborhood of 250 persons, a large number of whom are girls and women. It is one of the largest concerns engaged exclusively in this line. All varieties of handbag frames and mountings are made, requiring the employment of a variety of processes. The



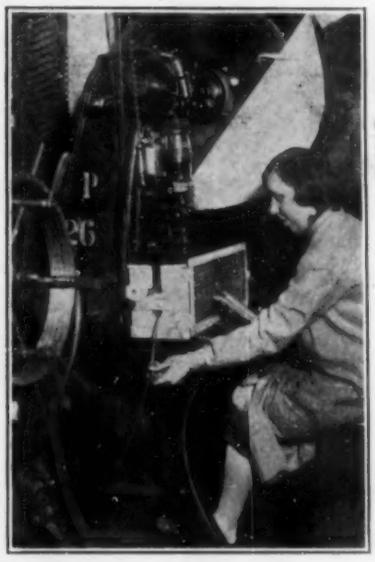
Parts of Handbag Frames Made by Frank J. Quigan, Inc.

work done in the plant may be divided roughly into two classes: metal working and metal finishing. The metal working departments include press rooms, tool and die, machine shop, soft and hard soldering, etc., and the finishing division includes electroplating, polishing, lacquering, burnishing, hand painting, and spraying departments.

At present about 65 per cent of the company's employees are male, the balance female. In 1928 there were, on the average, 150 male operatives and 102 females in the plant. The greater number of all the employees are machine operators. The equipment is of a light nature, generally, consisting of small foot and power presses, eyeletting machines and automatic rivetters in the metal working divisions, while in the finishing section there are sixty polishing lathes, fifteen plating tanks, two large automatic lacquering conveyors, and a number of spray booths.

### Piecework Preferred

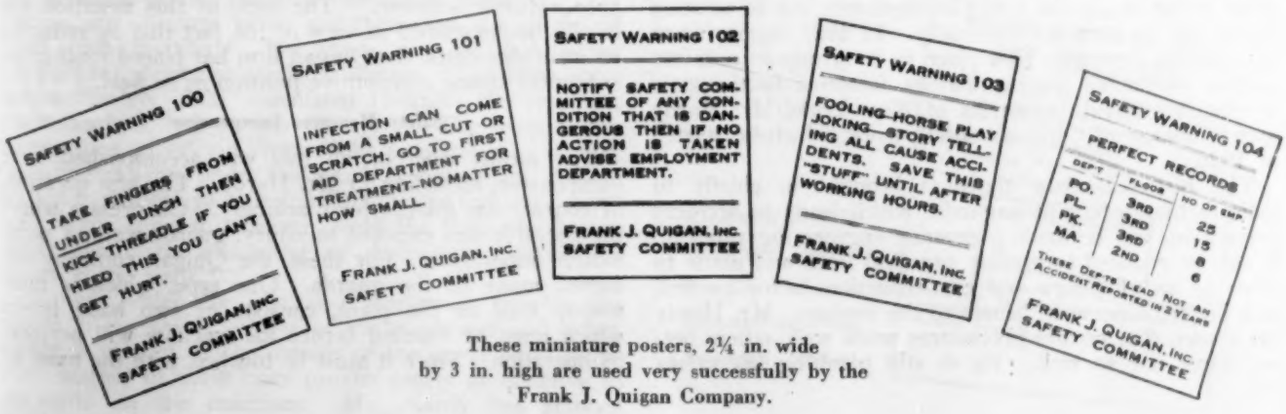
Most of the work is paid for on a piecework basis. The company has determined that such a basis is the simplest and best means of paying the workers for what they do. Each operation is carefully studied and standard production per hour established. The standard piecework rates are not subject to revision, even—as has happened a few times—if the company finds that the operator's earnings under a given rate are greatly in excess of the general average earnings of operators on similar work. New employees are paid on a time basis for about two weeks. However, should a new worker during this "breaking-in" period earn more on a piecework basis, he is paid on such a basis for the day or days the greater amount was earned. This plan is to provide full payment



Guards at Point of Operation on Punching and Cutting Machines Are Used Very Extensively in the Quigan Plant, Even at Cost of Slower Work. One Such Guard Is Shown Here.

of earnings for the experienced or exceptional worker who is entitled to it. The management has found this a good means of encouraging new employees.

The company's methods as thus far described, do not differ materially from those of many other metal manufacturing concerns. But the Quigan plant is almost unique in one respect—the safety factor. It was adjudged the safest of 93 metal working plants which engaged in a contest under the auspices of The Merchants' Association of New York, during the entire year 1928. For this




These miniature posters, 2¼ in. wide by 3 in. high are used very successfully by the Frank J. Quigan Company.

the company received the handsome silver vase shown in the illustration, an engraved brass plaque, and a great deal of praise from newspapers and the industrial press. And all this was deserved.

### Hardy Experienced in Safety Work

The leading spirit in the Quigan company's safety campaign has been C. W. Hardy, industrial engineer, whom Frank J. Quigan, president of the firm, has given full co-operation and encouragement. Mr. Hardy is an old hand at safety work. As far back as 1921 he was assistant general manager and chairman of the safety organization of Simon Zinn, Inc., New York City, who also

**The Operator of this Machine Must Keep Her Left Hand on a Lever and the Right Occupied Out of the Way of the Punch or the Machine Will Not Work. This Prevents Injury Practically Without Fail.**

owned the Gem Safety Razor Corporation. The Zinn company made handbag frames, razors, blades and various types of metal novelties. There Mr. Hardy supervised the installation of many safety devices and effected great reductions in the firm's accident rate, not to mention increasing its earnings materially. In 1927, again, when the Quigan firm won first place in its group in a safety contest conducted among various factories in the state by the Associated Industries of New York, Mr. Hardy was in charge of Quigan's safety work, which he started in 1926.

The historical data above is brought in chiefly to indicate that safety propaganda, which leads to accident prevention, can be made a genuine engineering problem. It can be reduced to strictly practical lines and made to serve as an efficiency and cost-reduction factor as well as a factor of personal benefit to the worker. Mr. Hardy has shown that certain procedures work well, others better, some not so well. He is still planning his safety work and analyzing it. He believes that others can do the same, to the mutual benefit of employer and employed. Here is what has been done at the Quigan plant.

### Quigan's Safety Record

During the year 1928 this plant had no lost-time accidents whatever! The plant operated a total of 643,466 man hours during that year and not an employee was injured seriously enough to lose time by it. Aside from this very fine record of safety for the plant's employees—which is what the company has at all times sought, rather than material gain—the company could not help but make money as a result of the high degree of safety maintained. Thus, without deliberately trying to save money, the company's compensation insurance rates dropped from $3.08 per $100 of payroll in 1924 to $1.21 in 1928, a saving of some $7,000 per year. In 1929 the rate was cut down to 83 cents! The comparative table below shows how the company's compensation insurance rate has declined during the years the safety devices were being developed and safety propaganda was being spread in the plant.

**Quigan's Compensation Insurance Rates**

| Year | Rate Per $100 of Payroll |
|---|---|
| 1923 | $3.08 |
| 1924 | 3.25 |
| 1925 | 2.05 |
| 1926 | 2.15 |
| 1927 | 1.65 |
| 1928 | 1.20 |
| 1929 | .83 |

Manufacturers who consider insurance a fixed expense, Mr. Hardy points out, will do well to study the figures shown above. "Compensation insurance," says Mr. Hardy, "is one of the largest items of insurance which the manufacturer must carry, and it is not fixed but very variable. From a proper accounting standpoint, it should


**Signs Like This on Stairs and Other Parts of the Plant Where Accidents Are Likely to Happen, Help to Keep People Conscious of Their Danger.**

be absorbed in manufacturing costs. And indirect costs, which plant men are always seeking to reduce, can be cut down by assuring conditions under which the insurance expense is lower." The logic of this assertion can hardly be questioned in view of the fact that by reducing its insurance costs, the Quigan firm has placed itself in an extremely strong competitive position in its field.

### Safety Measures Inexpensive

The means whereby all this was accomplished were inexpensive, according to Mr. Hardy. The first question, of course, was guards for machinery. On presses where the operator was exposed to injury, guards were of paramount importance. For these, the Quigan company designed many of the guards. One type, which is most widely used in the plant, consists of two hand levers which must be touched before the machine will perform its operation. Since it must be touched with the hand or

hands which need protection, these members cannot be injured. The hands are on the lever, out of the way of the punch, when the treadle is operated. On other machines the dies or cutting tools had to be enclosed in mesh wire guards. Some machines have guards which literally push the operator's hands away from danger. Some will not complete an operation when the operator's hand is in a position where it can be hurt. The latter type of guard consists of a steel rod which moves downward with the moving part of the press. If a hand is in its way, the rod, stretched across the full width of the machine, will touch the operator's hand or arm and stop the machine before the punch can hurt the operator. Many guards have been designed for belting, gears, grinding and plating machinery. Acid carboys are held in safe holders which will not let the carboys spill and injure the workman. The plating tanks are well protected, where necessary, with fume exhausters. Windows are kept clean, dark parts of the plant are well lighted, stairs are unobstructed.


**Employees at the Quigan Plant Are Kept Informed of Their Success in Accident Prevention. A sign at the Time-Clock Is Sure to Be Seen.**

Above everything else, the company maintains constant watchfulness for unsafe practices, unsafe places and all other details which might make for risk. Not the least of the company's efforts are directed to the employees themselves. "After you have put in all the safety devices you can possibly apply," says Mr. Hardy, "there is still a great deal of possibility for accidents to occur. The employees must be impressed with the need of playing safe at all times. The gospel of safety must be hammered into them persistently." And he has done it. Bulletin boards, pay envelopes, specially printed cards, and verbal exhortation are all employed in making the workers "safety-conscious."

### Safety Propaganda

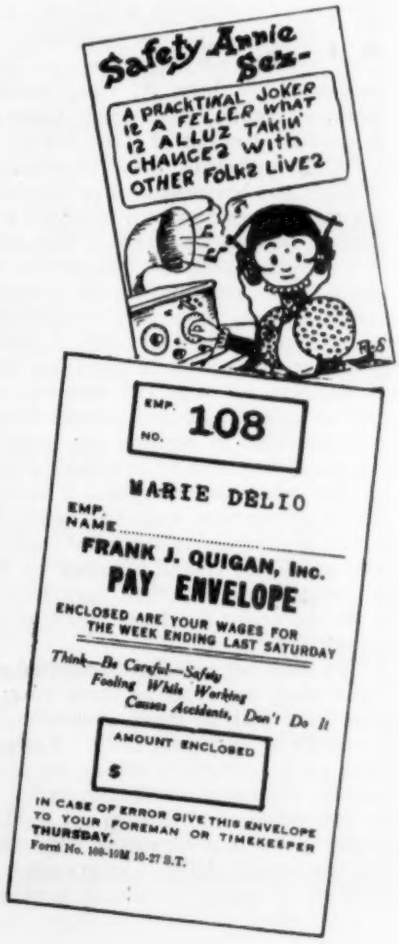
Some of the cards and envelopes are shown in the accompanying illustrations. Of the several ideas used for keeping workers aware of their danger and the need for precaution at all times, Mr. Hardy has found the most effective to be the cards attached to the machines and the work benches. The cards, about 2 by 3 inches in size, are placed in specially designed iron holders which are attached to the machines and work benches. The holders are of sheet metal and their cost was about 37 cents each installed. The cards are left before the workers for about two weeks at a time. Each bears some salient "Safety Talk" calculated to make the employee more cautious, less subject to injury. The workers are admonished to refrain from fooling on the job; to take their fingers from under the punch before setting the operation in motion; to go immediately to the first aid department when injured, however slight the hurt may be; to notify the safety committee of dangerous practices or places in the plant.

Stuffers which the insurance companies provide are placed in the pay envelopes of the employees and safety advice is printed on the outside of the envelopes. However, neither of these have proven nearly as effective as the cards on the machines. Mr. Hardy has stopped workers on Thursdays to ask them what the stuffers or envelopes had to say about safety. Only about two per cent of the persons asked could remember the message they had read on Wednesday (pay day). But when he has gone through the plant and tested the value of the cards on the machines by covering the card suddenly and asking the operator what it said, he found that nearly one hundred per cent could repeat the message.

### The Personal Touch

The management uses certain other methods of advancing its safety measures. On bulletin boards are posted notices which preach in a friendly, considerate manner the necessity of guarding against accidents. Some of the forms these notices take are of interest. One type of poster is intended to make the workers more careful by "shaming" them into it. It will cite a case of an avoidable accident, give the cause, and name the person involved. This may cause slight irritation to the operator thus publicly reprimanded, but it will also make many others careful not to put themselves in the way of being similarly humiliated. Another type of notice "stacks up" one department against another by showing how many minor accidents have been noted in the one, how few in the other. "All this might seem silly or childish to some manufacturers who are accustomed to strictly impersonal dealings with their help," Mr. Hardy says. "We don't look at it that way. We know it's not foolish because it works and keeps our people from getting hurt. We don't care how an idea looks as long as it works. We're out to make this plant a safe, pleasant and profitable place for the workers as well as the management." He has proven the value of his system in terms of almost no injuries to workers as well as in terms of dollars saved for the company.

The safety committee is probably the backbone of the accident prevention system in the Quigan plant. This committee was formed by Mr. Hardy when he began his safety work at the plant. It consists, first, of an employee who is known as the weekly inspector. He explores the plant once a week and, under a list known as "Eleven Specific Items" he notes possibilities of hazard and means of overcoming it. The specific items are such things as machine hazards, transmission equipment, stairs, etc. He does this on Thursdays. Then




**Mr. Hardy Says the Miniature Posters Are 50 Times as Effective as These Envelope Stuffers.**

there is a monthly inspection committee composed of three employees, one of whom is a female. They do once a month what the weekly inspector does each week. Their trip around the plant is a check on the weekly inspector's observations. It sometimes causes controversies between the weekly inspector and the monthly inspection committee, but it makes for greater safety. Typed reports of all recommendations are kept in the office of the company. On the third Tuesday of each month a meeting is held at which six employees are present, and which a different foreman each month is requested to attend. Here all recommendations are considered, discussed, approved or disposed of otherwise. Minutes are kept; the number of recommendations carried out are reported and recorded; those still to be executed are brought up and their execution is hastened or held over, according to the conditions involved.

"Most plant executives," says Mr. Hardy, "might meet the proposal of such inspections and meetings with the cry, 'Oh, we can't do this; it takes too much time.' Sure it takes some time. But here is the actual time it takes:

"The weekly inspection, one-half hour per week for one man; monthy inspection committee of three employees, one-half hour per month each; monthly meetings, one hour for seven employees. Is that too much time for a few employees in any organization to expend trying to save a friend's finger, hand, arm or even life?"

**Helps Cut Labor Turnover**

As previously stated, there has been a great gain in safety to the workers. There has been an improvement in efficiency, which, in the case of piece-workers, especially, is profitable to employee as well as employer. It might also be useful to state another interesting by-product of the Quigan company's safety program. According to Mr. Hardy, the company has only a small labor turnover, its workers generally being so satisfied with their remuneration and conditions that they are inclined to stay with the company as long as possible. However, a certain amount of labor turnover must be had, and, while this factor is in many plants a source of great expense and difficulty, with the Quigan firm it is practically no trouble at all. Plenty of workers are always available to this company because of its reputation for good treatment of its employees and, above all, for the safeness of its plant.

"It can be done!" says Mr. Hardy. "Quigan's employees have entered four "no-accident" contests, in three of which they have been winners, while the fourth is still in progress.

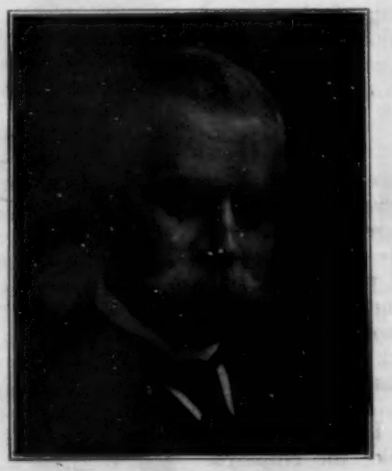
"This one now is the endurance contest of Associated Industries of New York State, and to keep their contest record at 100%, Quigan's must win this one. It may take a year or more."

# Outlook for Business in 1930 Favorable, Says Coe

## Head of American Brass Company Urges Confidence in Future—Looks for Large Metal Consumption Due to Electrification and Other Work

CONSIDERABLE confidence in the prospects for business during the coming year, especially in the metal and allied lines of trade and industry, was expressed by John A. Coe, president of the American Brass Company, Waterbury, Conn., in a recent statement to a correspondent of THE METAL INDUSTRY. He said:

"The gathering of industrialists, bankers and business men in Washington in December proved to be a Confidence Creating Congress. The spirit of excessive optimism was not in evidence but on the contrary the congress was composed of a very conservative body of men who had made a survey of the situation in their particular lines of business all over the country, not only as to the past and present conditions but also as regards the probable volume of business to be expected during the next few months. The consensus of opinion was that never before in our history had general business been so closely bound together by ties of mutual interest, thus contributing to the necessity for team work of the highest type.



John A. Coe

"No member of the Congress expected then, nor does he think now, that the gathering of these men will, in itself, immediately restore business to the levels of 1928 and 1929. Rather it is, and must continue to be, simply a means to an end, emphasizing, if possible, the necessity of cooperation between business and the individual; and this, in my opinion, will be the determining factor to a very great degree as to the extent of our progress during 1930. As a matter of fact, the published opinions of many leaders at that conference were most encouraging for the coming year, particularly in the matter of expenditures for rehabilitation, replacements and reconstruction. Great stress was laid upon the necessity of further expansion in the field of investigation, research and development, in this way putting us in a position to secure definite knowledge rather than to rely upon 'Rule of Thumb' and 'Guess Work.'

"As to our particular business, operations in the copper and brass fabricating field increased very much during 1929. In fact, it has been the largest twelve months in our history. We have reason to believe that our customers are not overstocked but that, on the contrary, they will require large quantities of our material to permit of further expansion of their own manufacturing operations. We are perhaps too close to the inventory period to expect much increase in volume of business right now, but if the contemplated programs for renewing and improving facilities by the railroads, electric service corporations, automobile manufacturers and others are carried out, our business during 1930 should be excellent.

"This does not mean that we shall have no problems to solve. We all have them and it will continue to be necessary to devote much time and study to these matters if we are to maintain the high standards of the past, and make reasonable progress in the future. It is for all of us, as far as possible, to do whatever we can, based upon good, sound judgment, to create a feeling of confidence which will be a strong factor in helping to increase the hours of labor in the weeks just ahead."

# THE METAL INDUSTRY

With Which Are Incorporated

The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

Member of Audit Bureau of Circulations and The Associated Business Papers

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Edition this Month, 6,500 Copies. Buyers Guide, Advertising Page 91

# Editorial

## High or Low Copper

The tug of war is still going on. Copper is still at 18 cents and sales are still at a minimum. As Wall Street continues to change its mind daily about the outcome of this struggle and the prices of copper stocks vary with these changes, copper producers are cutting production while consumers continue to hold back. Discussions go back and forth in the public and trade press on the fairness of the 18-cent figure, the stand taken depending upon whose ox is gored.

The situation simmers down to very simple fundamentals. The producers have set a price at which they can earn profits—undoubtedly good profits. Consumers are not buying. Is this because they object to the price? Would they buy more at 16 cents or 14 cents? We doubt it. Consumers will buy when they need the metal. They paid 18 cents willingly for a long period because they needed supplies and were able to sell them. Now that consumers have no orders of their own, they are holding back, naturally enough, in order to keep their inventories at a minimum. When they need metal, they will buy. The fact is that consumers are interested in one thing more than anything else—stability of prices. Without attempting to judge whether 18 cents is a fairer price than 16 cents or 14 cents, it is safe to say that everyone will be better off if the price is steady at any not unreasonable figure.

Statistics of the uses of copper point to the fact that its future is not precarious. Depending as it does largely upon the electrical industries for outlets, it is in the fortunate position of having as its mainstay, a field which is growing steadily. The use of electric power in industry is steadily increasing. The use of electrical household equipment has taken a firm hold on the public imagination, and is also going ahead. The electrification of railroads is almost unscratched ground, but one which has such strong adherents as the Pennsylvania and the New York Central railroads. Plans for railroad electrification are more extensive for the coming year than they have ever been before.

It is our opinion that copper at 18 cents per pound will be sold in just as large quantities as copper at 16 cents. At this time at any rate, there should be no substitutions of other and cheaper materials for copper at those levels.

Incidentally foundries, plating shops and manufacturers may well take a leaf from the copper men's book. They should set prices at a good level and hold those prices.

## Competing Metals

The rapid and continued progress of aluminum in new fields of industry and the success of copper, in finding new outlets in old industries, followed by the remarkable achievement of nickel in finding a comfortable place for itself in peaceful pursuits after the armor plate business had been almost wiped out, have awakened the steel industry to the needs and possibilities of roving afield instead of staying at home. Alloy steels are an old story by now, but up to very recent years their place has been in the steel industry, that is, replacing older less efficient steels. Now, however, we find steel casting its eyes upon uses formerly considered the outright property of the copper and aluminum alloys.

Stainless steel, a high chromium alloy, made a great impression on the market, but it was restricted to the higher grade and more expensive tools which formerly had been made of other steels. Now, however, we have a new steel which goes under various trade names, a chromium-nickel-iron alloy which contains from 7 to 10 per cent nickel, 17 to 20 per cent chromium, generally about 0.5 silicon and 0.2 carbon. This steel, besides going into engineering fields has entered the lists for kitchen utensils, flatware, dinner ware, large kitchen equipment and decorative installations in buildings. We have therefore, what seems to be one of the earliest moves on the part of steel to carry the attack into the territory of non-ferrous metals. Aside from its physical properties this type of steel is said to have unusual corrosion resistance. It is noteworthy that the Chrysler Building in New York with its 1000 foot tower has chosen it for some of its architectural work.

It behooves the non-ferrous metals to take stock. The building and architectural field has always been wide open to copper and its alloys. Nickel alloys are popular and aluminum is beginning to be used in considerable quantities, as for example in the Koppers Building in Pittsburgh, which required over 106,000 pounds of aluminum alloy. The price range for the special steel is higher than ordinary structural material, but still low enough to compete with nickel and higher grade copper alloys.

It is an old story that eventually, under proper handling, every material finds its place. It has also become evident, however, in these days of high pressure business, that nothing will find its place unaided by help from its friends. There is a place for chrome nickel steels just as there is for copper, nickel and aluminum alloys, and eventually, the fields, which are at this time seemingly competitive, will be allotted to the most suitable alloy. This will take time to determine, however, as only practical experience can prove conclusively what we need to know. In the meantime, competitors must be alive and keep themselves in the limelight. The rule will be first come first served for trials, and trials must be undergone before acceptance as standard equipment.

Guesses for the future are futile. Recently, one official of a large steel company predicted the use of steel sheets for highways suggesting their permanence as the leading advantage. There are obvious disadvantages, of course, such as cost and the need for rust prevention. The fact is, however, that steel is looking ahead and around as never before, and no non-ferrous metal can rest entirely on its laurels, but must keep abreast of the times.

## Support Electroplating Research

There are two reasons why there has been trouble in the electrodeposition of chromium: (1) Many electroplaters and a greater number of plant engineers did not understand the fundamental principles of the electrodeposition of any metal for decorative purposes; (2) Neither made sufficient use of the data that had been obtained through research and published. The papers published by the United States Bureau of Standards' for example, which cover a large number of subjects on electrodeposition, are a mine of information.

That Bureau and the American Electroplaters' Society have cooperated during the past three years in the study of such problems as Spotting Out and many phases of Chromium Plating. Another three-year program has been planned to investigate methods of improving the electroplating of metals, so as to afford the greatest amount of protection against that costly enemy of metals —corrosion.

Manufacturers, engineers and electroplaters should support this work and there should be a liberal response to the requests for contributions which are being sent out. That the work is worthy of support is proved by what

has been accomplished. Below is a partial list of completed researches on the electro-deposition of metals published from the Bureau and directed by Dr. William Blum:

Factors Governing the Structure of Electrodeposited Metals.
The Influence of the Base Metal on the Structure of Electrodeposits.
Current Distribution and Throwing Power in Electrodeposition.
The Crystalline Form of Electrodeposited Metals.
A Simple Method for Measuring Polarization and Resistivity.
Regulation of Electrotyping Solutions.
Preliminary Studies in the Electrodeposition of Copper in Electrotyping Baths.
Relation Between Composition and Density of Aqueous Solutions of Copper Sulphate and Sulphuric Acid.
Addition Agents in Copper Electrotyping Solutions.
Zinc Cyanide Plating Solutions.
Acid Zinc Plating Baths.
Lead Plating from Fluoborate Solutions.
The Use of Fluorides in Solutions for Nickel Deposition.
The Acidity of Nickel Depositing Solutions.
The Effect of Impurities in Nickel Salts Used for Electrodeposition.
The Effect of Iron on the Electrodeposition of Nickel.
Nickel Anodes.
Conductivity of Nickel Depositing Solutions.
Throwing Power, Cathode Potentials and Efficiencies in Nickel Deposition.
The Nickel Plating of Zinc and Zinc Base Die Castings.
The Protective Value of Nickel Plating.
Nickel Electrotyping Solutions.
The Measurement of pH in Nickel Plating Solutions.
Black Nickel Plating Solutions.
Principles and Operating Conditions of Chromium Plating.
Electrodeposition of Chromium from Chromic Acid Baths.
Health Hazards in Chromium Plating.
Mechanical Applications of Chromium Plating.
Throwing Power in Chromium Plating.
The Conductivity and Density of Chromic Acid Solutions.
The Protective Value of Chromium Plating.
The Production of Electrolytic Iron Printing Plates.
The Spotting of Plated or Finished Metals.
The Electrolytic Reproduction of Engraved Printing Plates.
The Electrodeposition of Lead-Tin Alloys.
The Properties of Graphite Used in Electrotyping.
Purification and Analysis of Alkali Cyanides.

The Research program of the American Electroplaters' Society is going on, of course. It is an important part of this program to have the co-operation of the Bureau of Standards in this research work and the active guidance and assistance of Dr. Blum.

## Business Is Coming Back

Business is "coming back." According to authoritative reports, not only from Washington but also from centers of industry, the low point of the depression has been passed and business is now definitely on the upgrade. Steel production has risen from 40 to 60 or 65 per cent of capacity, and steel is admittedly the index.

There is still work to be done. We have the whole year ahead of us and we cannot depend upon the momentum of an increased government construction program, even though along with it go expansion and improvements by the railroads and public utilities. In the last analysis business depends upon the effort of everyone to keep the wheels moving.

In the words of Secretary Lamont, "No condition ever justifies useless, wasteful or untimely public expenditures, but present economic conditions justify an effort on the part of every community to proceed promptly with the construction of all desirable and timely improvements that may be helpful in the absorption of any unemployment and assist in the stabilization of wages." This statement applies to the individual business just as much as it does to the community. Does your plant need revamping? Do it now. Is your equipment obsolete? Replace it now. Are you contemplating improvements in your layout and in your methods? Make them now. Have you decided upon expansion? Build now. Keep expenditures within the limits of your financial strength. Do not over-expand, but whatever expenditures you may be decided upon, make them now. There is no better time.

Business is decidedly better and will continue to improve, but there is no surer stimulus than a sane, consistent policy of making expenditures at the time when they will do the most good.

## No Superfluous Entertainment

The American Foundrymen's Association has taken a bold and progressive step in making its plans for the 1930 convention, to be held in Cleveland, May 12-16. At a recent meeting of the Board of Directors, the following resolution was unanimously adopted.

"Whereas, the practice of lavish, unwarranted and wholesale entertainment in hotel rooms and elsewhere is being indulged in by certain exhibitors and others attending conventions of the American Foundrymen's Association, resulting in conditions inimical to the best interests of said Association,

"And whereas, such practices detract from and tend to defeat the purposes of such conventions, reflect discredit on the men of the industry, and discourage companies from sending their representatives to such conventions,

"And whereas, such practices result in excessive, unnecessary and unwarranted expense, contrary to good business ethics and practices,

"Now therefore, be it resolved, by the Board of Directors of the American Foundrymen's Association at the annual meeting held in the City of Cleveland, Ohio, September 12, 1929, that exhibitors and all other interests concerned be requested to cooperate in the abatement of such practices, and that the Manager of Exhibits and the Committee on Convention Arrangements be and they hereby are authorized and directed to take such action as in their judgment may be expedient or necessary to abate such practices."

The resolution speaks clearly for itself. The practice of excessive entertainment, almost always coupled with lavish dispensation of liquor, is a blot on the clear records of any honest and serious business or professional organization. It is unethical to get business by such means. It is wasteful in that the excessive cost must eventually be borne by the purchasers of equipment and supplies. It is unwholesome for perfectly obvious physical and moral reasons.

The Foundrymen's Association is to be congratulated upon its honesty and courage in attacking this evil openly. Let us hope that such iniquitous practices will be defeated without a struggle.

## Census of Manufactures

The Department of Commerce is working on the coming census which will be the most comprehensive statistical compilation ever undertaken in this or any other country. It will necessitate the employment of over 125,000 people to canvass dwellings, farms, shops, factories, stores and other establishments for data.

For the first time we are to have a census of distribution which means the gathering of statistics concerning wholesale and retail trade, showing the number of persons employed, principal expenses of such concerns, the stock of goods on hand as of December 31st, 1929 and the sales of commodity groups classified geographically.

The need for such information is obvious to everyone in business. Each manufacturer is urged by the government to see to it that the list of questions of the census is filled out accurately and completely, and as promptly as possible. Preliminary reports will be sent out shortly.

# Correspondence and Discussion

## Developments in Manufacture of Pewter Ware

The following correspondence is self explanatory, representing a letter from THE METAL INDUSTRY to one of the largest manufacturers of silverware in the country and that manufacturer's reply to us, which we reprint by permission. We refer our readers also to the series of articles on Pewter beginning on page 64 of this issue.—Editor.

To the International Silver Company:

We are informed that some interesting developments have taken place in the manufacture of pewter ware. Among these is the use of an inexpensive base metal (not pewter) which is plated and then finished to resemble pewter.

Is our information on this matter correct? We should be glad to receive from you any information you can give us in addition to the above; also, to be referred to anyone who could give us this information if you are not in a position to do so.

Thank you for your co-operation in this matter.

New York, N. Y., THE METAL INDUSTRY.
January, 1930.

To the Editor of THE METAL INDUSTRY:

Your letter in reference to interesting developments in the manufacture of pewter ware has been received. From the point of view of the International Silver Company, we can divide this question in two parts, namely, hollowware and flatware.

In hollowware there have not been many interesting developments except from the point of view of design. Relative to the material, we always have used and always will use the accepted standard mixture for pewter, which is around 92 or 93 per cent tin, the rest being antimony and copper. In no case do we use any lead whatsoever.

In other words, we are not cheapening the product by using ulterior methods. In connection with pewter hollowware, we have heard, but never investigated, the rumor that some manufacturer is using a brass base metal and plating the article with tin to resemble pewter. This, of course, is a practice which should be condemned from every angle.

The other division is flatware. Appreciating the fact that pewter hollowware is having such a vogue, the thought occurred to us as manufacturers of flatware that it would be nice, and proper, to have a set of flatware to go with the pewter hollowware.

Naturally, it was impossible to use pewter metal, due to the wear it would receive. You can readily understand that a fork in pewter would not last overnight. So we took one of our nickel silver patterns, plating this with chromium, and in our advertising we named this the "Pewter Pattern."

Knowing that this really was not pewter, and knowing that there might possibly be some confusion in the minds of the purchasing public from the use of the name "Pewter Pattern", we explained this in the advertising matter by saying that it was chromium plated.

This is the only information we know of that would be of interest as a development in the manufacture of pewter ware although, as we explain above, we do not in any way, shape, form or manner claim that this flatware is pewter ware.

We trust this will answer your question.

Meriden, Conn., INTERNATIONAL SILVER COMPANY,
January, 1930. H. C. Wilcox, Hollowware Sales Department.

## Lead-Coated Copper Sheets

To the Editor of THE METAL INDUSTRY:

In reading the December issue of THE METAL INDUSTRY I find on page 561, under heading of "Pickling of Copper Sheets", the following:

> Coating copper with pure lead by hot application process is a difficult problem. We know of no commercial production of this material.

I am writing to inform Mr. Pettis, author of the statement, that the American Brass Company has, during the past year, produced considerably more than 50,000 pounds of lead-coated copper which is used for architectural purposes such as roofing, copper gutters, and leaders. The material we produce has a relatively rough coating which, for many uses, is required for its architectural effect. There are the concerns Lamb and Richie of Cambridge and the Leadcote Products Company of Everett, Mass., to whom we furnish copper sheets for the production of smooth surface, lead-coated sheets.

I thought that Mr. Pettis might be interested in receiving this information.

Waterbury, Conn., F. C. SMITH, Sales Engineer,
January, 1930. The American Brass Company.

To the Editor of THE METAL INDUSTRY:

I have read with interest Mr. Smith's statement regarding the successful production of lead-coated copper sheets, and will be glad to correct any wrong impression my article in the December issue of THE METAL INDUSTRY may have occasioned.

I am assuming we both vision the same type of sheet, i.e., one with a smooth coating of commercially pure lead. As indicated, a request for information on the subject gave occasion for the statement written by me. I will quote some comments made in 1928 and 1929 regarding certain experience, or with material secured through the trade, in an effort to get a sheet covered with pure lead:

1. Coating not firmly adherent.
2. The presence of tin or zinc, presumably from the flux used; a solution of the chlorides of tin or zinc.
3. The lead alloys with tin, the tin running from 5 per cent up.

I intended no criticism of lead covered sheets showing a small percentage of tin as they satisfy perfectly a wide range of demands, but I am defending the statement made by me regarding PURE lead coated copper sheets.

I shall be glad to be corrected on this.

Lisbon, Ohio, WILLIAM J. PETTIS,
January, 1930. Associate Editor.

## Chromium Formula Works Well

To the Editor of THE METAL INDUSTRY:

I am pleased to let you know that the formula you supplied me for a chromium solution has turned out excellently. The solution throws well and up to the present I have had no trouble whatever.

I should also like to say that in my opinion THE METAL INDUSTRY is one of the best books any plater can have.

Thanking you again for the chromium formula.

Birmingham, England, C. WILLIAMS.
December, 1929.

## GOVERNMENT PUBLICATIONS

**Obtainable from Superintendent of Documents, Government Printing Office, Washington, D. C., at prices mentioned, unless otherwise noted.**

**Magnesium and Its Compounds in 1928,** by Paul M. Tyler; **Antimony in 1928,** by Paul M. Tyler; **Graphite in 1928,** by Jefferson Middleton. Each is part of "Mineral Resources of the United States, 1928"—Part II, issued by Bureau of Mines, Department of Commerce. Price, 5 cents each.

**Alphabetical Index and Numerical List of Federal Specifications.** Circular No. 378, Bureau of Standards, Department of Commerce. Price, 5 cents.

**Beryllium and Beryl,** by Alice V. Petar, Bureau of Mines, Department of Commerce. Circular No. 6190, obtainable from Bureau.

# New Books

**Platers' Guidebook.** By Oliver J. Sizelove. Size 5 x 8, 104 pages. Published and distributed, free, by THE METAL INDUSTRY and BRASS WORLD.

There is a need in the electroplating field for a more extended pocket manual or guidebook on plating practice. The Platers' Guidebook was written primarily with the purpose of filling this need.

Mr. Sizelove, the author, is a recognized authority on electroplating, being associate editor of THE METAL INDUSTRY and head of the electroplating and finishing department of August Goertz and Company, Newark, N. J., manufacturers of metal novelties requiring a wide variety of finishes. The formulae given for electroplating solutions and metal coloring are tried and tested, having been proved workable through years of practical experience.

Methods of analysis are given for different plating solutions so that even those with little or no chemical knowledge may be able to apply them and to obtain results by means of these ready methods which are quite accurate enough for the chemical control of any plating solution.

The contents of this booklet include:

Formulae for solutions (nickel, copper, brass and bronze, zinc, cadmium, lead, tin, chromium, iron, silver, gold, platinum).

Metal coloring (various finishes for silver, copper, brass).

Analysis of plating solutions (nickel, copper, zinc, silver, chromium, cadmium).

In addition to the subjects listed above, there are sections on the prevention and cure of nickel itch, lacquers and lacquer enamels, spotting out, polishing, buffing and coloring. Special tables, useful in the analysis of plating solutions, have been added and an extended list is given of chemicals used in electroplating shops, with their technical and trade names.

All members of the American Electroplaters' Society will shortly receive copies of this book and all others who are interested may obtain copies by request to the publishers.

**Commercial Chromium Plating.** By Richard Schneidewind, associate investigator, Department of Engineering Research, University of Michigan, Ann Arbor, Mich. Published as No. 3 of the Circulars Series, by this University. Price, 50 cents.

Synopsis: Good chromium plating practice depends on the plater's ability to maintain correct and identical conditions in the following four essentials:

1. Temperature of solution in contact with the work.
2. Current density on the surface of the work.
3. Condition of the surface of the work.
4. Composition of the plating bath.

Since some of these necessary plating conditions are quite dependent on well designed equipment, the general principles for the design of such equipment have been given in this circular, although equipment has been dealt with only in a general way. The effect of variations in plating conditions, such as temperature, current density, and composition of solution has also been presented, for it is believed that such information will be of interest and value to the practical plater who will then know what to expect when the plating conditions change.

**A. S. T. M. Tentative Standards—1929.** The American Society for Testing Materials, 1315 Spruce Street, Philadelphia, Pa. Size, 6 x 9; 901 pages; prices, $7 in paper and $8 in cloth binding.

The 1929 issue of the tentative standards contains 173 items, 24 of which relate to ferrous metals, 10 to non-ferrous metals, 38 to preservative coatings and petroleum products, and the balance to such materials as concrete, coal, coke, lime gypsum, clay products, textiles, rubber and others. These tentative standards are published with a view to eliciting criticism, which will be given cognizance before the tentative standards are finally adopted as standard. These tentative standards, as well as the finally adopted standards of the Society, are recognized as authoritative in the fields of engineering to which they refer and should be accorded the attention of all who are interested in the standardization of materials as to quality.

**Material Control and Storeskeeping in Foundries and Machine Shops.** By Willis Wissler. Published by Ohio State University Press, Columbus, Ohio. Price, $1.50 to Ohio residents; $2.50 to non-residents.

Primarily a case study in foundry and machine shop practice, this book contains precise descriptions of the methods in force at ten important plants. The Central Ohio Manufacturers' Association contributed much data on routines, forms, devices, etc., used in connection with materials control and general stores distribution. Flow charts are included, designed to show in the simplest possible classification form the sequence, direction and nature of the various steps taken in using the records and forms in the text of the study.

**The Movement for a Sounder Money.** The Stable Money Association, 104 Fifth Avenue, New York. 54 pages, paper covers, 5 x 7¼; price, 50 cents.

This book consists of the following articles: "The Stability of Money," by Owen D. Young; "The Scientific Approach," by Norman Lombard; "Research and Education," by Frederic A. Delano; "The First Necessity," by Sir Josiah Stamp; "Unemployment and Monetary Fluctuations," by Henri Fuss; "The Problem of Prosperity," by Carl Snyder. An interesting series of views on a problem that affects life in general and business and industry in particular.

**Bibliography of Bibliographies on Chemistry and Chemical Technology.** By Clarence J. West and D. D. Berolzheimer. Published by The National Research Council, Washington, D. C. First Supplement, 1924-1928, Bulletin No. 71; size, 6¼ x 9¾; 162 pages; price, $1.50.

This is a supplement to a previous bibliography on the same subject issued in 1925 and is to be used in connection with that one. In keeping with the Council's usual standards, the book has been carefully and exhaustively compiled and very nicely printed. The value of such a work is obvious and hardly needs comment.

**States of Mind Which Make and Miss Discoveries, with Some Ideas about Metals.** By Sir Oliver Lodge, D.Sc. Published by The Institute of Metals, 36 Victoria Street, Westminster, S.W.1, London, England. Size, 5½ x 8½, paper; 32 pages; price, 5s., net.

This is Sir Oliver Lodge's lecture on metals before the British Institute of Metals last May. According to the Secretary, there has been so great a demand for it that it has been taken from the "Journal" and made into a separate booklet, for general distribution.

**Sparking of Steel.** By E. Pitois; translated from the French by John D. Gat. Published by The Chemical Publishing Company, Easton, Pa. Size 6 x 9; 89 pages and introduction, preface, etc. Price, $2 postpaid.

A new method of ferrous analysis, carefully expounded. This consists largely in the observation of the sparks produced by the iron or steel in order to determine easily and rapidly the general components, such as carbon, manganese, nickel or Chromium, tungsten, etc. There are 32 illustrations of spark streams.

**The Chemists' Pocket Manual.** By Richard K. Meade, M. S. Published by The Chemical Publishing Company, Easton, Pa. Size, 4 x 6; 533 pages; illustrated; price, $5.00 postpaid.

This is the fourth edition of this well known manual which is widely used by chemists, assayers, metallurgists, manufacturers and students. It contains tables, formulas, calculations, physical and analytical information and methods, etc.

**Electroplating with Chromium, Copper and Nickel.** By Benjamin Freeman and Frederick G. Hoppe. Published by Prentice-Hall, Inc., New York. Size 6x9; 212 pages; price $5.00; obtainable from THE METAL INDUSTRY.

Issued as we go to press. An extended review of this important new book will appear in our next issue.

# Shop Problems

**This Department Will Answer Questions Relating to Shop Practice.**



## Acid Copper Solution

Q.—We contemplate installing an acid copper solution. Please give us a formula for such a plating solution.

A.—Acid copper solutions are workable over a wide range of metal and acid content. An excellent formula is published in Blum and Hogaboom's book on plating and finishing of metals, as follows:

| | |
|---|---|
| Water | 1 gal. |
| Copper sulphate | 24 oz. |
| Sulphuric acid | 13 oz. |

The quality of the deposit and the rate of deposition is dependent on maintaining the acid content in proportion to the metal content as here given. Use compressed air for agitation and higher voltages may be used to speed up deposition.—W. F., Problem 3,932.

## Bright Dipping Brass Parts

Q.—Can you tell us what acid, or combination of acids, can be used for dipping brass parts to obtain a bright finish?

A.—Brass parts, either castings or parts from rolled sheet brass, blanked, drawn or stamped, may be bright dipped to bring out the natural color of the metal by first dipping in a firing dip made up as follows:

| | |
|---|---|
| Aqua fortis or nitric acid | 1 part |
| Sulphuric acid | 1 part |
| Muriatic acid | 1/100 part |

Free from oil, grease, etc., by immersing work in hot caustic soda solution, six ounces per gallon of water; rinse; immerse work about thirty seconds in firing dip; rinse in cold water; repeat if necessary. Shake off all excess of rinse water and immerse in the following bright dip.

| | |
|---|---|
| Aqua fortis or nitric acid | 1 part |
| Sulphuric acid | 3 to 4 parts |
| Muratic acid | 1/150 part |

This bright dip should be set in running cold water and kept cool. To get the best results, the work should be passed through this dip as rapidly as possible and the quicker the acid can be rinsed from the work the better the results will be. Spent acid from the bright dip can be added to the firing dip and used to good advantage.—W. F., Problem 3,933.

## Chromium and Acid Copper

Q.—Please give formulas for chromium and for acid copper solutions.

A.—Formula for chromium solution:

| | |
|---|---|
| Chromic acid | 55 oz. |
| Sulphuric acid | 0.3 oz. by weight |
| Water | 1 gallon |

Use 6% antimony lead anodes. Cathode current density should be 50 to 75 amperes per square foot. Temperature, 95° F.

Formula for acid copper solution:

| | |
|---|---|
| Copper sulphate | 28 oz. |
| Sulphuric acid | 4 to 6 fluid oz. |
| Water | 1 gallon |

Operate solution at 1 volt with a cathode current density of 8 to 10 amperes per square foot. —O. J. S., Problem 3,934.

## Copper Plating Leather

Q.—Please inform us regarding the copper plating of baby shoes. What we wish to know especially is the best method of waterproofing the leather; then metallizing with graphite or bronze, and the length of time it should take to deposit sufficient copper on the leather to insure a base that will take a polish before silver plating.

A.—The procedure for plating babies' shoes is as follows:

The shoes should be coated thoroughly with orange schellac mixed with alcohol. This may be applied by brushing or spraying and will make them waterproof.

They are then sprayed with plater's copper bronze powder which is mixed with 1 part of lacquer and 4 parts of thinner. It is better to spray 2 or 3 thin coats than one coat that is too heavy. After they have been allowed to dry thoroughly, plate in acid copper solution until a sufficient thickness of copper has been obtained for polishing. The length of time they must be plated depends to a great extent on the condition of the copper solution—usually from 24 to 36 hours.—O. J. S., Problem 3,935.

## Chromium Installation

Q.—We would like some information in the matter of installing chromium plating equipment. We have a 1000 amp., 6 volt generator and unlined steel tanks, but presume that we have not the remaining requirement. We want to know what is required and how it should be set up.

There seem to be some special solutions or processes for sale but we are inclined to think that special solutions are not necessary. In any event, we want to get all the dope we can on the matter of chromium plating.

A.—Formula for chromium solution:

| | |
|---|---|
| Chromic acid | 55 oz. |
| Sulphuric acid, C. P. | 3 oz. by weight |
| Water | 1 gallon |

Temperature 95° F., cathode current density, 50 to 75 amperes per sq. ft.; 6 per cent antimony lead anodes are recommended; and a glass-lined iron tank. The tank should be equipped with an exhaust system that will successfully take away all fumes that are produced when solution is in operation.

A 1,000 ampere, 6 volt generator should be of sufficient capacity to operate a 150 gallon solution.—O. J. S., Problem 3,936.

## Nickel on Printing Plates

Q.—We are advised that you are equipped to analyze solutions for plating trouble and we are sending you a bottle of our nickel solution and also a small printing plate.

We call your attention to the printing face of this plate, it being pitted. We have on two or three occasions been bothered with the same trouble; it seems to come and go; therefore, if you can throw any light on this trouble for us we will certainly appreciate it.

A.—Analysis of nickel solution:

| | |
|---|---|
| Metallic nickel | 2.64 oz. |
| Chlorides | .56 oz. |
| pH | 5.6 oz. |

For depositing nickel on lead molds, both the chloride content

and the pH should be increased. Add 1½ oz. ammonium chloride to each gallon of solution, and to each 100 gallons add 8 oz. of 26° ammonia.

Write to H. G. Guiteras, Field Secretary, International Association of Electrotypers, Leader Building, Cleveland, Ohio, for a copy of booklet entitled "Nickel Electrotyping Solutions," which contains useful data on your class of work.

—O. J. S., Problem 3,937.

## Pewter and Brass Solutions

Q.—I would greatly appreciate it if you would advise me as to the best way to make a pewter solution to deposit on unbreakable metal, and also a brass solution to give a yellowish color. We manufacture lighting fixtures.

A.—Formula for brass solution:

| | |
|---|---|
| Copper cyanide | 4 oz. |
| Zinc cyanide | 1 oz. |
| Carbonate soda | 2 oz. |
| Ammonium chloride | 1 oz. |
| Water | 1 gallon |

Use at 80° F., with cathode current density of 2.5 to 3 amperes per square foot.

As pewter is an alloy of tin and lead, we believe that it will be quite difficult to deposit an alloy of these two metals. We would suggest that you use a lead solution for your class of work, as a deposit from this solution resembles pewter very closely.

Suggested formula:

| | |
|---|---|
| Carbonate of lead | 20 oz. |
| Hydrofluoric acid, 50% | 32 oz. |
| Boric acid | 14 oz. |
| Water | 1 gallon |

Reference: "Principles of Electroplating and Electroforming," by Blum and Hogaboom. —O. J. S., Problem 3,938.

## Printing on Bright Nickel Silver

Q.—We are seeking information concerning the proper process for printing black on metal, particularly bright finished nickel silver, and will appreciate anything you can tell us as to kind of type and kind of ink or material for making clear letters. Perhaps you can furnish addresses of firms who furnish equipment and material for doing such work.

A.—This can be done by either the direct printing method or offset printing. The direct method gives faster production, and equipment for this method can be purchased from printing press manufacturers. The offset method is slower and equipment must be designed for the job. Dies may be made with either raised or sunken characters, depending on the type of work to be done.

For direct printing, steel dies should be used, sharp faced. For offset printing, softer dies can be used, such as zinc etchings. To get good covering of the ink it may be necessary to make more than one impression, especially where the characters are small and will not hold much ink. To get uniform good results by either method it is necessary that the surface and thickness of the plates to be printed on be uniform.

In both processes the heaviest, stiffest ink that can be purchased readily should be used to prevent dragging. Trial will determine the right kind for the job. Printing ink manufacturers will be glad to work with the customer to develop the proper kind.

If there should be losses or rejects due to faulty printing and it is desired to reclaim the metal for reprinting, the offset method is preferable because no impression is made on the metal itself as would be the case in using the direct printing method.

—W. F., Problem 3,939.

## Silver Plating Hollow Ware

Q.—Can you give me any information on stripping and silver plating of hollowware such as tea sets, trays, pitchers, knives, forks, spoons, etc., such as used by high class hotels? Some of these are made of britannia metal, some of lead and some of metals I do not recognize. Please suggest a good book on this subject.

How do you refinish doctor's tools?

A.—If you are to refinish hollowware that is made of soft metal, the procedure would be first to strip all the old silver deposit from the article in a cyanide solution made of 12 oz. sodium cyanide and water 1 gallon. Use reverse current and agitate the work being stripped. The work should then be wet scratch-brushed, dried, and sand-bobbed or polished to produce an even smooth finish. The work is now ready for plating and the following procedure will give good results:

Clean in an alkaline cleaner to remove all grease or polishing compound and strike the work in a special silver strike made of 8 oz. sodium cyanide, ¼ oz. silver cyanide, and 1 gallon water. After this operation, place in regular silver strike made of 6 oz. sodium cyanide, ⅔ oz. silver cyanide, 1 gallon water, and immediately place in regular silver solution made of sodium cyanide 5 oz., silver cyanide 3 oz., ammonium chloride ¼ oz., water 1 gallon.

After the work had been plated in the silver solution until the desired amount of silver has been deposited, the work is yet scratch-brushed lightly and then polished.

To refinish doctor's tools it is now customary to remove the old deposit of nickel by polishing, then to nickel plate and polish and then to chromium plate. This method produces a most satisfactory finish and one that will not tarnish.

We recommend Langbein's "Electrodeposition of Metals," which is for sale by THE METAL INDUSTRY.

—O. J. S., Problem 3,940.

## Silver Solution Data

Q.—I am sending you a sample of my silver solution for analysis and advice. Work comes from the solution streaky and brownish, not snow white as it should. Anodes show dark gray while work is in bath. The anodes become a brown-black in about 2 hours. I add plenty cyanide. A large tray comes out plated fairly white, but in the center of it there will be a brown spot. In burnishing the tray the spot makes its appearance.

I have a job silver plating shop and the silver I add to the solution comes from an acid strip. It is well cleaned with boiling water. I am positive there is no salt in it. Our old silverware is stripped in a blue lead tank. Dip is composed of nitric and sulphuric acids. Silver chloride is well washed. Do you think lead from the stripping tank gets into the silver solution?

Please advise as to means of preventing streaking.

A.—Analysis of silver solution:

| | |
|---|---|
| Metallic silver | 3.40 oz. |
| Free cyanide | 9.56 oz. |
| Carbonates | 13.3 oz. |
| Lead | trace |

The silver and free cyanide contents are good, and, while the carbonate content is very high, we do not believe that this is the cause of your trouble. If you are using the proper current density, about 4 to 5 amperes per square foot, and the cathode and anode surfaces are about equal, we are inclined to think that possibly it may be the lead that is the cause of your trouble.

We certainly would not advise the use of a lead tank for stripping the silver work if you wish to add the silver to your silver solution by precipitating the silver from the strip as a chloride. You can precipitate the silver from the silver strip as metallic silver by the use of copper strips, washing the metallic silver thoroughly, dissolving with nitric acid, and then precipitating as a chloride with muriatic acid or sodium chloride. With this method you would not get any of the lead into the silver solution.

—O. J. S., Problem 3,941.

## Tin-Aluminum-Silver Solution

Q.—Please advise correct proportions per gallon of solution of the following chemicals: Tin chloride, aluminum phosphate, silver nitrate, potassium carbonate, sodium cyanide.

This is supposed to plate a bright white with a tinge of blue. What anode do you recommend?

A.—If you wish to try the formula, we would suggest the following proportions of each chemical:

| | |
|---|---|
| Tin chloride | 1 oz. |
| Aluminum phosphate | 2 oz. |
| Silver nitrate | ½ oz. |
| Potassium carbonate | 2 oz. |
| Sodium cyanide | 2 oz. |
| Water | 1 gallon |

Use solution at a temperature of 80° F.; 1 to 2 volts; tin anodes. While we have never heard of this formula, would suspect that silver would predominate in the deposit.—O. J. S., Problem 3,942.

# Patents

## A Review of Current Patents of Interest

**Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.**

1,727,331. Sept. 10, 1929. **Process of Coating Aluminum Electrolytically.** Carl L. Beal, Rochester, N. Y., assignor to Eastman Kodak Company, Rochester, N. Y., a Corporation of New York.

In the process of electroplating an aluminum surface, the steps of treating said surface in a dilute aqueous alkaline bath without electrolysis, treating said surface as the cathode in an acid dilute aqueous bath under non-oxidizing conditions, and thereafter electrodepositing a coating upon said treated surface.

1,727,736. September 10, 1929. **Apparatus for Electrolytic and Similar Treatments.** Floyd T. Taylor, Matawan, N. J., assignor, by mesne assignments, to Hanson-Van Winkle-Munning Company, Newark, N. J.

An apparatus for electrolytic and similar treatment, comprising separate tank compartments, together with a common conveying mechanism adapted to conduct different work holders respectively through substantially parallel paths, one of said paths leading through one of said compartments and another of said paths leading through another of said compartments.

1,728,052. September 10, 1929. **Aluminum-Welding Rod.** Henry Gilbert, Philadelphia, Pa.

A welding rod composed of substantially 88.74 per cent of aluminum, 2.42 per cent of copper, 8.06 per cent of cadmium and .78 per cent of bismuth.

1,728,772. September 17, 1929. **Solder.** James Silberstein, Wilkinsburg, Pa., assignor to Westinghouse Electric & Manufacturing Company, a Corporation of Pennsylvania.

A solder comprising an alloy of lead and thallium in the proportions of 99 per cent to 80 per cent lead and 1 per cent to 20 per cent thallium.

1,728,940 and 1,728,942. September 24, 1929. **Method for Producing Uranium and Uranium-Zinc Alloys.** John Wesley Marden, East Orange, N. J., assignor to Westinghouse Lamp Company, a Corporation of Pennsylvania.

The method of forming uranium in stable form which comprises reducing uranium oxide by means of calcium in the presence of calcium chloride and simultaneously reducing zinc chloride therewith.

1,728,941. September 24, 1929. **Production of Rare Metals.** John Wesley Marden and Malcolm N. Rich, East Orange, N. J. assignors to Westinghouse Lamp Company, a Corporation of Pennsylvania.

The method of preparing tantalum, vanadium and columbium metal powder free from hydrogen and nitrogen, which comprises heating a mixture containing an oxide of these metals, calcium and calcium chloride, in a sealed or evacuated container in the presence of an alkali metal.

1,728,989. September 24, 1929. **Apparatus for the Electrolytic Production of Metallic Powders.** Matthew Atkinson Adam, London, England.

Apparatus for electrolytic purposes comprising in combination an electrolytic cell, an anode, a cathode, a horizontal shaft for aforesaid cathode, means for rotating said cathode shaft, a horizontal shaft mounted above said cathode at right angles to the cathode shaft, a flexible member on said shaft contacting with said cathode and means for rotating said member.

1,729,196. September 24, 1929. **Process for Recovery of Tin and Similar Functioning Metals From Materials Containing the Same.** Harry V. Welch, Los Angeles, Calif., assignor to International Precipitation Company, Los Angeles, Calif.

The method of recovery of tin and similar functioning metals from materials containing the same, which comprises introducing a mixture of air, a reducing agent and a halidizing agent beneath the surface of a molten body of such material so as to cause combustion of a portion of such reducing agent, and to also cause production and volatilization of the halide of the metals to be recovered.

1,729,208. September 24, 1929. **Alloy and Method of Working and Heat Treating the Same.** Michael G. Corson, Jackson Heights, N. Y., assignor to Electro Metallurgical Company, a Corporation of West Virginia.

Process of changing certain of the physical characteristics of copper-base alloys containing silicon in the range of 3.7 per cent to 6.7 per cent, comprising subjecting the metal to heat treatment at a temperature of approximately 500° to 800° C.

1,729,339. September 24, 1929. **Alloy of Magnesium.** John A. Gann, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

As a new product, an alloy containing from 90 to 95 per cent of magnesium and between 10 and 5 per cent of cadmium.

1,729,607. October 1, 1929. **Process for Electrodeposition of Metal.** Fred K. Bezzenberger, Cleveland, Ohio, assignor, by mesne assignments, to Aluminum Company of America, Pittsburgh, Pa.

An electrolyte for electrolytically depositing iron composed of a ferrous sulfate solution containing precipitated iron hydroxide in suspension and having a thick mud-like consistency.

1,729,631. October 1, 1929. **Process of Reclaiming Scrap Metals.** Theron D. Stay, Cleveland, Ohio, assignor, by mesne assignments, to Aluminum Company of America, Pittsburgh, Pa.

The improved process of reclaiming light, readily oxidizable metals from finely divided scrap metal which comprises freeing the scrap metal of particles of iron, adding the scrap metal to a molten bath of metal of the kind to be reclaimed in which there are upwardly and downwardly directed currents of circulation, quickly immersing the scrap metal in the molten bath.

1,729,765-6-7. October 1, 1929. **Cleaning of Metal Surfaces.** Clarence F. Dinley, Detroit, Mich.

A coating and drying composition for removing foreign substances such as rust, rust stimulants, and oil from metal surfaces preparatory to painting; comprising compatible solvents for the said substances in combination with a finely divided vehicle and powdered absorptive amorphous carbon.

1,729,801. October 1, 1929. **Die-Casting Machine.** Albert Sebek, Cicero, Ill., assignor to Krone-Sebek Die Casting & Mfg. Co., Chicago, Ill.

In a casting apparatus, the combination of a molten metal container, a hollow ladle adapted to be filled with molten metal from said container through an integrally formed nozzle, said ladle having a pivotal support at its rear end and a pivotal connection at its front end located above the top of the ladle.

1,730,003. October 1, 1929. **Ruthenium Alloy.** Melvin M. Goldsmith and William H. Falck, Chicago, Ill.; said Falck assignor to Goldsmith Bros. Smelting & Refining Company, a Corporation of West Virginia.

As a substitute for osmiridium, an alloy comprising ruthenium about 75 per cent, tungsten about 17½ per cent and nickel about 7½ per cent.

1,730,087. October 1, 1929. **Coating Internally of Hollow Articles With Metal.** George Needle, Coventry, and Frederick William Lanchester, Birmingham, England, assignors to The Daimler Company, Limited, Coventry, England.

A method of coating internally with metal to any desired thickness a hollow metal article which consists in introducing into the article a suitable flux and the desired quantity of metal for the coating, causing a direct alloying between the metal constituting the article and metal for the coating by erratically rotating the article relatively to the coating metal.

1,731,021. October 8, 1929. **Bearing-Metal Alloy.** Karl Müller and Wilhelm Sander, Essen, Germany.

A bearing metal alloy comprising about 70 to 75 per cent of lead, about 15 to 25 per cent of antimony, about 3 to 6 per cent of tin, about 1 to 3 per cent of a metal of the cobalt type, about 0.6 to 2 per cent of copper, and an appreciable amount not exceeding 1 per cent of metals of the iron group.

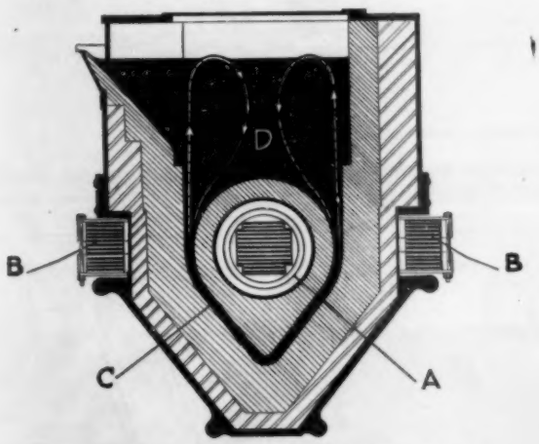
# Equipment

## New and Useful Devices, Machinery and Supplies of Interest

### Electric Zinc Melting Furnace

Announcement of the development of an electric furnace for melting zinc and zinc base alloys is made by the Ajax Metal Company, Frankford avenue below Girard avenue, Philadelphia, Pa. This company manufactures the well-known Ajax-Wyatt induction furnaces for brass melting. The principles of the brass melting furnace have now been embodied in a furnace designed for zinc and zinc base alloys. The company states that the singular features which have made its brass furnace universally popular for brass melting have been incorporated in the zinc furnace, which has undergone complete and thorough tests at the makers' laboratories. The tests as well as subsequent commercial operation are said to have exceeded the expectations of the designers. Following are some of the features claimed for it:

Heat is generated directly in the metal, making the melt the hottest part of the furnace and eliminating heat lag generally encountered in melting metal. Temperature control is as nearly




**Cross-Section Diagram of Electric Zinc Furnace**

perfect as possible, no special apparatus being necessary to compensate for heat drop through furnace walls, there being none. Metal bath is automatically and thoroughly mixed by stirring action produced by electrical forces, a feature claimed as unique in this furnace, insuring homogeneity of alloys melted in it. Furnace is readily operated by unskilled labor, no mechanical or electrical adjustments being necessary. Absence of fumes and coolness of exterior make it possible to place the furnace in production line directly. No iron pot is used, avoiding contamination danger from this source. Operation is noiseless. The principle of the Ajax-Wyatt furnace is shown clearly in the cross-section diagram herewith:

By impressing a voltage on the primary coil "A" the furnace transformer "B" is energized (standard shop supply of 220 or 440 volts, 60 cycle, single phase current is used). This induces a voltage in the "V" shaped channel "C," which is always filled with the molten alloy and acts as the secondary of the transformer. A current of relatively high value flows in this "V" shaped channel, and, due to the resistance of the molten metal, heat is generated at an absolutely constant rate, it is stated. At the same time the magnetic field about this channel sets up electro-magnetic forces which eject the hot metal out of the channel, which in turn is replaced by colder metal from the main bath "D" above the melting channel. This circulation follows the path shown in the drawing. The result of this internal stirring action is that the metal bath is thoroughly mixed. which is claimed to insure perfect alloying.

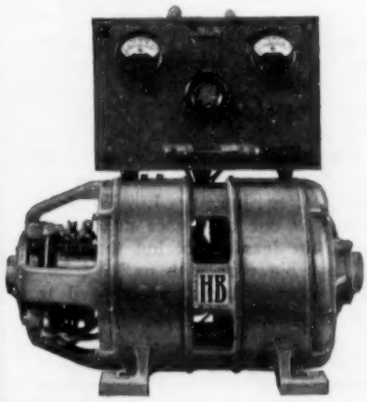
The furnace may be equipped with any type of tilting mechanism to suit a particular melting process. Some installations are provided with a counterweighted tilting arrangement which allows the furnace to pour about an axis through the spout. By this system, the metal is poured directly from the furnace into the moulds, eliminating all hand ladling.

### Constant Potential Motor-Generator

Hobart Brothers, Troy, Ohio, manufacturers of a variety of electrical equipment, offer electroplating generator sets with built-in motors in sizes for all plating needs, from 100 to 1,500 amperes. The company makes the following claims as to the advantages of its products:

Single unit, ball bearing construction, making for high efficiency; motor and generator on single shaft, eliminating extra bearings and saving space; internal, voltage-regulating winding, with patented diverter-pole construction, for dependable voltage regulation; good commutation and cool operation; conservative rating policy of company assuring ample capacity for peak loads and eliminating strain; central control panel mounted directly on machine, making it possible to check output at any time and eliminating guesswork; voltmeter and ammeter in proper location for showing actual output of machine under load or no-load conditions; field rheostat with 17 graduations making for ease of setting machine for desired voltages within rated capacity; complete construction of motors and generators in Hobart plant is stated to insure dependability and efficiency as well as complete factory service at any time.

**Constant-Potential Motor-Generator Set**



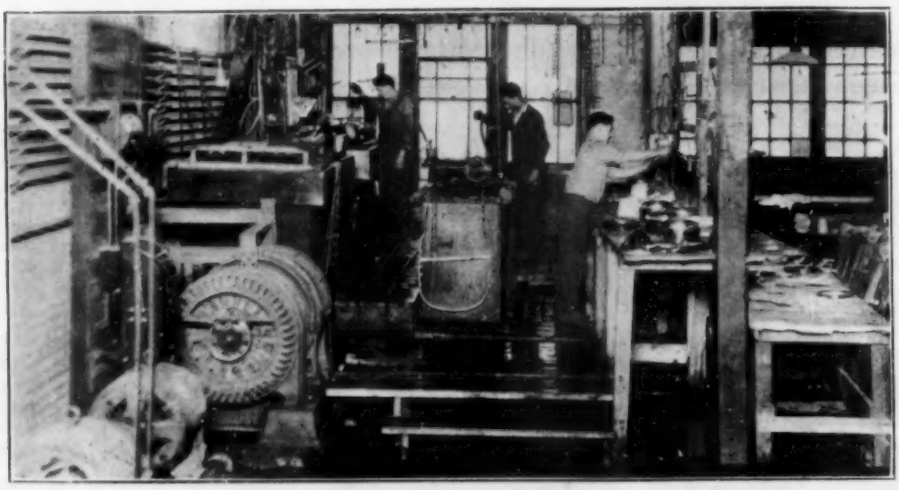

The Hobart company offers its Bulletin L-2 describing chromium plating motor-generator sets, as well as other types.

### New Plating Supply Firm

The McGean Chemical Company was incorporated in June, 1929, with headquarters in the Keith Building, Cleveland, Ohio, to engage in the manufacture of chemicals, specializing in products for the plating, ceramic and paint and varnish industries. The initial building program comprising six manufacturing units was completed in October, 1929, and have been in operation since that time. Of particular interest to the plating industry is a new anode foundry equipped with the latest improvements for casting nickel, copper, brass, cadmium and other anodes; also buildings for the manufacture of various plating salts regularly used by the industry.

J. A. McGean, formerly president of The Harshaw Fuller and Goodwin Company, Cleveland, is president. Among those associated with Mr. McGean in his new enterprise are his son Ralph L. McGean, C. E. Ott, P. M. Savage and V. H. Waite, all former executives of The Harshaw Fuller and Goodwin Company.

# Plating Plant Expands as Big Year Is Anticipated

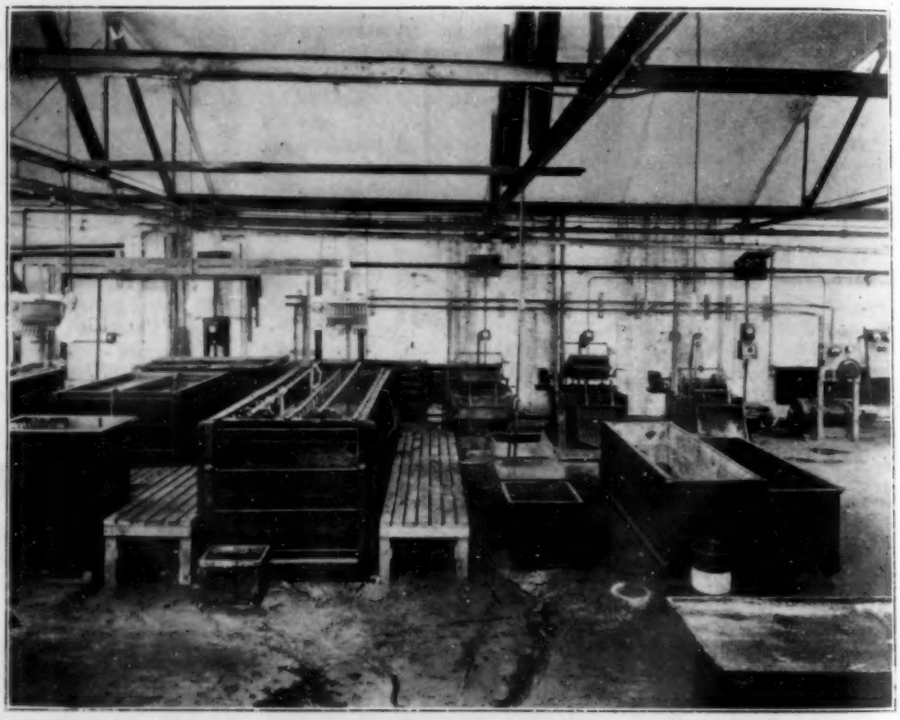


**At Left Is a View of the Chromium Plating Department of the Evaco Industries Plant. Immediately Below Is a View of the Nickel and Copper Section of the Big Plating Shop.**

The Evaco Industries, with headquarters at 1329-31 Vernor Highway, Detroit, Mich., E. V. Allen, owner and director, has just completed installing a great quantity of new machinery and other equipment for chromium plating.

In spite of the recent so-called business decline, this organization has been operating day and night in order to keep up with orders. When asked what he believed the new year had in store for the plating industry, Mr. Allen promptly replied:

"It looks so promising to me that a short time ago I placed a large order for polishing wheels to be delivered after January 1. There is business if one only goes after it. I haven't the least doubt but that 1930 will be a big year with us."



The pictures here are intended to show as plainly as possible the hook-ups and arrangements of machinery planned so as to obtain a maximum of efficiency with the least expenditure of effort and cost. Every bit of machinery is operated on an individual drive and not a piece of shafting can be seen in the entire place. Besides the plant proper, a complete laboratory is maintained which also has supplemental assistance from the Detroit Testing Laboratory, Detroit, Mich.

The Evaco organization specializes in big work in chromium plating. For instance, it recently finished plating the doors and grill-work of a new bank building in Detroit. Recently Mr. Allen was engaged on some very particular chromium work for new motor cars under construction for exhibition at the automobile shows.

Another specialty is the chrome plating of metal parts for outdoor signs, and still another is the plating of the wearing parts of pumps.

Mr. Allen says he can see no end to the possible use of chromium and is called upon daily to put this type of plating into some new and novel use.

**At the Right Is Shown a View of the Polishing Department of the Evaco Industries Plant.**

## New Chromite Cement Developed

Botfield Refractories Company, Swanson and Clymer Streets, Philadelphia, Pa., has developed a new high temperature cement which will be added to its line of "Adaproducts" and sold under the trade name of "Adachrome Plastic Super-Cement."


**A Drum of Adachrome**

In this new cement, the basic material is an exceptionally high-grade chromite ore obtained from South African deposits.

Because of its chromite base, "Adachrome Plastic Super-Cement" is chemically inert, and is also hard, dense and highly refractory, the makers state. Furthermore, the new cement employs a bonding agent which is very efficient at high temperatures.

Among the destructive furnace actions to which this new cement is resistant are basic and acid slags, molten metal penetration, abrasion, erosion and chemical reaction in the burning of acid sludge. In addition, the material, when applied as a surface coating on boiler settings, protects the brickwork from the penetrating action of clinker and fusible coal ash, it is claimed.

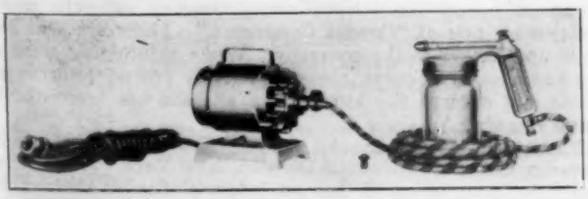
In the field of chrome cements, "Adachrome Plastic Super-Cement" is reported to be the only cement sold in plastic form, ready for use without heavy mixing prior to use. The material is suited for making either dipped or troweled joints. Another feature is exceptional plasticity, which contributes to ease of handling and working. The material is recommended by its manufacturer for laying up fire clay brick, silica brick, chrome brick, high alumina brick and also for laying up magnesite brick under certain conditions. It is also adaptable for use as a surface coating material, and as a binder in the mixture of patching materials for repairing burned-out sections of refractory construction.

The new cement will be packed in heavy gauge metal drums with full-size openings adding to convenience of use. The drums, which are painted a distinctive yellow with red lettering, have air-tight covers that prevent waste or deterioration of the material. Two sizes of drums, 250 lb. and 500 lb., are available. Complete data is offered by the manufacturer to those interested.

## Light Duty Spraying Outfit

A new spray-painting outfit developed by The DeVilbiss Company, Toledo, Ohio, is said to provide in one compact, easily portable unit of ultra-modern design, splendidly efficient equipment for all light duty work in shop and factory. This new DeVilbiss model is low priced but offers surprising capacity and true dependability, according to the maker, whose description is quoted as follows:

The light weight and compact size of this outfit give it a truly universal utility. It occupies no more space than an electric chafing-dish. The specially designed air compressor and 1/5 h.p.



**Small Spraying Outfit**

universal electric motor which drives it, weigh but 5¼ pounds. The spray gun weighs but 1¼ pounds, and does not tire the arm even with long-continued use as it is so light.

The spray-painting outfit embodies specific features which give it far greater capacity and efficiency for a spray outfit of this type and price. The high air pressure produced by the powerful little motor and the advanced design of the pressure feed spray gun produce complete, fine atomization of the material. Easy adjustment of air cap enables the operator to atomize perfectly any paint, lacquer or other material that may be in use.

Two air caps give a choice of round spray or a full fan spray several inches wide. The atomizing efficiency of this spray gun makes it possible to use practically any kind of painting or finishing material. It will also spray insecticides and disinfectants effectively. The pint size glass container has standard Mason jar thread. Ordinary Mason jars can be used for extra containers.

This equipment is stated to bring to the home and shop the principles and advantages enjoyed by industries using larger equipment. The gun body and compressor housing are of high-grade aluminum alloy. Nozzle caps, fluid tip, valves and other parts are of brass, nickel-plated and nicely finished. The equipment comes complete, ready to use after plugging into any 110-volt electric socket. There are no accessories to buy. The complete unit consists of the DeVilbiss type GT spray gun, rotary compressor with switch, 15 feet of air hose, and connections, 10-foot extension cord and plug, and brass wire for cleaning.

## Drill Stand with Sensitive Feed

A radial drilling stand with sensitive feed has been placed on the market by The Hisey-Wolf Machine Company, Cincinnati, Ohio, manufacturers of portable electric machine tools, etc. The newly designed stand is furnished for all Hisey portable electric drills up to and including ⅞ inch capacity. One size is shown in the illustration.

**Radial Drill Stand**

The lever feed of the stand is operated through rack and pinion as in a drill press, which, according to the manufacturer, permits a very positive and sensitive control without fatigue to the operator. Design is such as to permit the portable drill to be attached without removing any part of the machine, attachment being accomplished by means of motor holding brackets. This is said to save time and protect against loss of parts.

The following general specifications are given:

Vertical adjustment (without resetting) by means of lever through rack and pinion, 7½ inches; vertical adjustment up and down on the main column, 13 inches; total vertical adjustment, 20½ inches; diameter of main column, 2 inches; the full arm length will swing in a complete circle of 360°; maximum arm reach from column to drill spindle, 13 inches; net weight, 150 pounds.

The same radial drilling stand can also be provided with suitable brackets for wall or post mounting.

## Aluminum Bus Bars

The Aluminum Company of America, Pittsburgh, Pa., manufactures aluminum bus bars for electroplating equipment for which it claims such advantages as weight cut in half as compared with copper; cooler operation; lower cost, etc. The company offers a booklet on this material, gratis.

## Rubberoid Plating Tank Lining

A practical means for making plating tanks leak-proof and acid-proof to most acids is claimed for "Belke Rubberoid," placed on the market by the Belke Manufacturing Company, 321-333 South California Avenue, Chicago, Ill. This composition is said to be 30% rubber and 70% pitch. Besides protecting against tank leakage in a very satisfactory way, this composition is said to present a large saving to electroplaters.

"Rubberoid" is easily applied with a brush. It is distributed in tin containers and can be applied to tanks when they are wet. It is an elastic material and one pound covers a square foot of surface one-fourth inch thick. The composition provides a lasting hard surface and will not crack or scale or run in the hottest weather, and is unaffected by most acids, according to the maker.

The advantage of "Rubberoid' is its economy, coupled with the satisfactory service it gives in tanks, it is stated. This is claimed to be one of the most economical means of maintaining plating tanks in a tight, leak-proof condition at very small cost. It protects either wood or steel tanks.

## The Automobile Show

The interest of a large part of the manufacturing facilities of the United States centered on the automobile show, which was held in Grand Central Palace, New York, January 4-11. The automobile show is no longer a private affair between the automobile manufacturers and the public. Almost every industry is concerned with it, as motors are such heavy consumers in so many different lines. This year interest was particularly keen in the prospects for the sale of automobiles for the coming year, as business conditions hinge to a fair extent on this question.

Certain features stood out sharply. There is continued striving for something new and something better. In some cases this takes the form of more speed, in others smoother operation and in still others safety devices, added conveniences, "gadgets," more attractive design, "snappy" lines, etc. One outstanding fundamental change was the introduction of the front drive by two cars, the Cord and the Ruxton.

Metals and finished surfaces, of course, are the backbone of automobile manufacture. With appearance still paramount plating and other forms of metal decoration occupy a prominent position in the automobile plant. The higher grade motors use aluminum wherever possible because of its light weight. The cheaper cars, necessarily less, but still brass and the bearing metals, tin and lead alloys, are used in considerable quantity.

The following list of accessory and supply manufacturers who exhibited will give an idea of the range of metal products shown:

A. C. Spark Plug Company, Flint, Mich.
Aluminum Company of America, Pittsburgh, Pa.
American Chain Company, Bridgeport, Conn.
American Hard Rubber Company, New York.
Apollo Magneto Corporation, Kingston, N. Y.
Bohn Aluminum and Brass Corporation, Detroit, Mich.
Cunningham Products Corporation, New York.
General Electric Company, Bridgeport, Conn.
Moto-Meter Gauge and Equipment Corporation, Long Island City, N. Y.
New Haven Clock Company, New Haven, Conn.
Pyrene Manufacturing Company, Newark, N. J.
A. Schraeder's Sons, Inc., Brooklyn, N. Y.
Tite-Flex Metal Hose Company, Newark, N. J.
Waltham Watch Company, Waltham, Mass.
Westinghouse Electric and Manufacturing Company, E. Pittsburgh, Pa.

## Pieced Buffs

Lewis Roe, 1050 DeKalb Avenue, Brooklyn, N. Y., has begun the manufacture of a full line of pieced buff wheels in conjunction with its regular line of used plating and polishing equipment and supplies.

# Equipment and Supply Catalogs

**Lathes.** The Monarch Machine Tool Company, Sidney, Ohio. New catalog, No. 131, 44 pages.

**C-E Multiple Retort Stoker.** Combustion Engineering Corporation, 200 Madison Avenue, New York.

**Hand and Power Bending Machines.** Wallace Supplies Manufacturing Company, 1310 Diversey Parkway, Chicago, Ill. Bulletin No. 26.

**The Baird Machine Company,** Bridgeport, Conn. Leaflet on wire and ribbon metal forming machinery, grinders, oblique tilting tumbler barrel, etc.

**In Harmony with Modern Progress.** Geuder Paeschke and Frey Company, 1359 St. Paul Avenue, Milwaukee, Wis. Book on use of pressed metal stampings.

**Engineering Achievements—1929.** Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Large illustrated booklet containing interesting information.

**Recording Pressure and Vacuum Gauges.** The Bristol Company, Waterbury, Conn. Catalog No. 1009, replacing No. 1008. Also, List of Charts Available for Use with Recording Pressure and Vacuum Gauges.

**Vancoram Review.** Vanadium Corporation of America, 120 Broadway, New York. This is Vol. 1, No. 2 of the company's magazine, containing a résumé of current literature on vanadium and its alloys and compounds.

**The Son of Paul Revere.** Revere Copper and Brass, Inc., Rome, N. Y. An interesting broadside reproduction of one of the institutional advertisements this newly formed concern is using. Excellent printing and design.

**South Bend Lathe Works,** South Bend, Ind., has issued the following catalogs: No. 33 for the Auto Mechanic; No. 44 for the Mechanic; No. 90-A, Lathes; No. 29, Brake Drum Lathe; No. 9, the New 9-Inch Lathe; No. 22, 9-inch Junior Lathe.

**Electroplating Data.** W. Canning and Company, Ltd., Great Hampton Street, Birmingham, England, have issued the following: Equipment for Warm Nickel Plating; Cadmium Plating; Developments in Chrome Plating. All are illustrated pamphlets.

**The Ideal Electrical Principle Applied to Zinc Melting.** The Ajax Metal Company, Electric Furnace Department, Frankford below Girard Avenue, Philadelphia, Pa. Pamphlet describing the newly developed Ajax-Wyatt furnace for zinc, similar to this type of furnace for copper alloys.

**General Electric Company,** Schenectady, N. Y., publications: Easy Method of Determining Cost of Operating Electric Motors and Appliances; Type WD-200A Arc Welder; Ditto, 300A; MD-400 Mill Motors; MD-400 Motor Sales; Synchronous Motors, an 85-page book, fully illustrated.

**Review of the Silver Market for 1929.** Handy and Harman, 57 William Street, New York. A very comprehensive review of the world market situation in this metal, one of the company's chief concerns, as is well known to all who use precious metals. The review has been carefully prepared, with tables of statistics and a variety of other information.

**Metal Cleaning Literature.** The Cowles Detergent Company, 7016 Euclid Avenue, Cleveland, Ohio, has issued a group of papers on various metal cleaning subjects, under the general title of "Cowles Comments." These are sent free upon application to the company. While mentioning some of the company's products, these pamphlets are scientific in attitude and deserve the attention of all who are interested in metal cleaning.

**Flexible Shaft Handbook.** The S. S. White Dental Manufacturing Company, Industrial Division, New York. A very comprehensive compilation of data on industrial flexible shafting for a great variety of purposes, as well as a catalog of this company's products. Gives engineering information, including data on motors, applications, illustrations and diagrams, etc. The book is distributed gratis, upon request, which should be made on firm stationery, stating position of the writer.

# Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

## American Foundrymen's Association

HEADQUARTERS, 222 WEST ADAMS STREET, CHICAGO, ILLINOIS

### Plans for 1930 Convention

Greater interest shown by an increasing attendance at the round table meetings and shop operation courses which formed a part of the past few conventions of the American Foundrymen's Association, has led the Program Committee to broaden the scope of these sessions for the 1930 annual meeting. The program for this year's convention, scheduled for the week of May 12 at Cleveland, Ohio, provides for three round table luncheon meetings, covering malleable steel and nonferrous foundry practice.

H. M. St. John, metallurgist for the Detroit Lubricator Company, Detroit, Mich., and an associate editor of THE METAL INDUSTRY, will preside at the nonferrous meeting.

No specially prepared papers will be presented at these informal luncheon meetings, but every one present will be given an opportunity to propose and to discuss any phase of management, metallurgical or shop practice he cares to bring up.

Three shop operation courses, organized expressly for the practical shop man, are scheduled. These will cover steel foundry operation, gray iron foundry operation and nonferrous foundry practice. Each course will consist of a series of three or four sessions, the leaders for each session being assigned a definite subject for discussion.

W. F. Graham of the technical division, Ohio Brass Company, Mansfield, Ohio, is in charge of organizing the course for the nonferrous foundrymen. The subjects which will be discussed at the non-ferrous course include crucible, open-fire and electric furnace practice.

D. E. Broggi, foundry superintendent and metallurgist, Neptune Meter Company, Long Island City, N. Y., will lead the discussion on the indirect-arc-type furnace, and C. H. Morken, plant metallurgist, Ohio Brass Company, will lead the discussion on the induction-type furnace.

In addition to round table meetings and shop operation course sessions, the usual sessions covering technical and managerial phases of the foundry industry will be held.

## Institute of Metals Division

HEADQUARTERS, 29 WEST 39TH STREET, NEW YORK CITY

### 139th Meeting of A. I. M. E.

The 139th Meeting of the American Institute of Mining and Metallurgical Engineers will be held at the Engineering Societies Building, 29 West 39th Street, New York, February 17 to 20, inclusive.

The Institute of Metals Division will present an extensive program of papers starting on Tuesday afternoon, February 18, with a session on Corrosion and general subjects. Two complete sessions on Wednesday will be devoted to Copper and Brass, and at 4 p. m., Dr. S. L. Hoyt, of the General Electric Company, will deliver the Annual Lecture, his subject being "Hard Metal Carbides and Cemented Tungsten Carbide." On Thursday there will be a symposium of eight papers on Melting and Casting Metals.

In the evening on Thursday, February 20, the Division dinner will be held at the Savoy-Plaza Hotel and G. H. Clamer, of the Ajax Metal Company, will speak on "The Induction Furnace for the Melting of Metals." Moving pictures are promised.

The following preliminary list of papers has been submitted for presentation. The list will be completed in the final program.

**Institute of Metals Division**

Hard Metal Carbides and Cemented Tungsten Carbide—by DR. S. L. HOYT (Annual Institute of Metals Lecture).

The Influence of Cyclic Stress on Corrosion—by D. J. McADAM, JR.

Stress-corrosion Cracking of Annealed Brass—by ALAN MORRIS.

Internal Stress and Season Cracking in Brass Tubes—by D. K. CRAMPTON.

Conversion of Alloys Subject to the Action of Locomotive Smoke—by F. L. WOLF.

X-ray Notes on the Molybdenum and Iron-tungsten Systems—by E. P. CHARTKOFF and W. P. SYKES.

Expansion Properties of Low-expansion Fe-Ni-Co Alloys—by HOWARD SCOTT.

Studies in Metal Crystal Orientation—I. Determination of Orientation of Metallic Single-crystal Specimens by High-voltage X-rays—by THOMAS A. WILSON.

Etching of Brass—by WALTER GRAHAM.

The Alpha-phase Boundary of the Ternary System Copper-silicon-manganese—by CYRIL S. SMITH.

Thermal Conductivity of Copper Alloys—I. Copper Zinc Alloys—by CYRIL S. SMITH.

The Alpha-beta Transformation in Brass—by ALBERT J. PHILLIPS.

Certain Types of Difficulties Occurring in Copper Wire as the Result of Improper Dies and Drawing Practices—by H. C. JENNISON.

Directed Stress in Copper Crystals—by C. H. MATHEWSON and K. VAN HORN.

Notes on the Distribution of Lead Impurity in a Copper Refining Furnace Bath—by J. WALTER SCOTT and L. H. DEWALD.

A Theory Concerning Gases in Refined Copper—by A. E. WELLS and R. C. DALZELL.

Comparison of Copper Bars Cast Vertically and Horizontally—by J. WALTER SCOTT and L. H. DEWALD.

Recent Development in the Melting an Annealing of Non-ferrous Metals—by ROBERT M. KEENEY.

Some Notes on the Melting and Casting of Gold and Silver Alloys—by EDWARD A. CAPILLON.

Monel Metal and Nickel Foundry Practice—by E. S. WHEELER.

Effect of Oxidation on Certain Impurities in Bronze—by J. W. BOLTON and S. A. WEIGAND.

The Influence of Silicon in Foundry Red Brasses—by H. M. ST. JOHN, G. K. EGGLESTON and T. RYNALSKI.

Melting Bearing Bronze in Open-flame Furnaces—by ERNEST R. DARBY.

Oxides in Brass—by O. W. ELLIS.

# American Electroplaters' Society

HEADQUARTERS, CARE OF GEORGE GEHLING, 5001 EDMUND STREET, PHILADELPHIA, PA.

## The Year's Activities

The work of the American Electroplaters' Society and its various branches during the past year was actively carried on and there were a number of highly important and profitable events recorded. Chief among these, of course, was the very successful convention at Detroit. Another was the addition of a new branch, at Los Angeles, which has been going strong ever since.

The rapid growth of the electroplating industry continues, and the Society is keeping stride with it. Practically all the branches have classes at which the platers are being taught the chemical analysis of plating solutions.

The research work of the Society as a whole is being carried forward steadily in connection with the United States Bureau of Standards. The Research Committee held a fine meeting last year at Newark, which was attended by several hundred platers and chemists, who heard papers on a variety of subjects, including chromium plating, cyanide solution analysis, spotting out, iron plating and others. Another such meeting will take place at Rochester, N. Y., March 22, 1930, at the Powers Hotel, which all platers are urged to attend. There will be an excellent program, including reports on the results of the research work of the past year, of which the whole Society can very well be proud.

—HORACE H. SMITH, Supreme President.

## Bridgeport Branch

HEADQUARTERS, CARE OF W. EHRENCRONA, BOX 301, R. F. D. 1, BRIDGEPORT, CONNECTICUT.

### Annual Banquet and Session

The annual banquet and open meeting of the Bridgeport Branch will be held at the Stratfield Hotel, Bridgeport, Conn., March 8, 1930. The session will begin at 2:30 p. m., and the banquet at 7:30 p. m. Entertainment and dancing will follow the banquet. All members of the A. E. S. and their friends are urged to attend.

## New York Branch

HEADQUARTERS, CARE OF J. E. STERLING, 2581 46TH STREET, ASTORIA, LONG ISLAND, N. Y.

### Annual Banquet and Session

The New York Branch will hold its annual banquet and educational session on Saturday, February 15, 1930, at the Aldine Club, 200 Fifth Avenue (corner 23rd Street), New York City. The banquet will commence at seven in the evening. In the afternoon, beginning at 3:30, there will be an educational session, with Charles H. Proctor as chairman. Papers of great interest to platers will be read and discussed. The session is open to everyone and all platers, chemists, finishers, plant executives and owners are urged to attend.

The banquet will be followed by dancing. Platers and their friends are urged to attend and bring the ladies. Reservations should be ordered as early as possible from the secretary, John E. Sterling, at address given above.

### Meetings in January

At the Branch meeting on January 10, Dr. L. C. Pan, instructor in electroplating at the College of the City of New York, gave a fine lecture on "Analysis of Nickel Plating Solutions."

There was another meeting January 24, when Oliver J. Sizelove, associate editor of THE METAL INDUSTRY and a member of the Newark Branch, was present to lecture.

—JOHN S. STERLING, Secretary.

## Rochester Branch

HEADQUARTERS, CARE OF CHARLES GRIFFIN, 24 GARSON AVENUE, ROCHESTER, NEW YORK

### Annual Banquet and Session, March 22

The Rochester Branch will hold its annual educational session and banquet on Saturday, March 22, 1930, at the Powers Hotel, Rochester. The committee appointed by President Reama to handle the arrangements is hard at work and it is certain that no plater should miss this event, which is generally expected to be the best ever held in Rochester.

The educational session in the afternoon will be under the direction of the Research Committee of the Society, which employs research associates to work at the Bureau of Standards at Washington. Dr. William Blum of that Bureau, widely known member of the Association and one of the greatest plating experts in the country, will be present, having accepted the invitation of this branch this year.

In the evening the banquet will be held.

—CHARLES GRIFFIN, Secretary.

## Boston Branch

HEADQUARTERS, CARE OF THOMAS JOHNSON, 47 WEST FIRST STREET, SOUTH BOSTON, MASS.

### Regular January Meeting

The regular monthly meeting of the Boston Branch of the American Electroplaters' Society was held at the American House, Boston, on Friday, January 10th. The meeting was called to order at 8:15 p. m. by President L. A. Gale, with 25 members present. Because of having two guest speakers the usual business was dispensed with in order to allow them sufficient time.

Dr. E. K. Strachan of Brown University spoke on and gave a demonstration of "Simplified Methods of Chemical Control." This talk was extremely interesting and should prove of very great value to the members.

W. F. Cahill of the J. B. Ford Company, spoke on "The Cleaning of Metals." An outline of various kinds of cleaning and the methods employed gave a comprehensive view of cleaning and brought out some very interesting facts.

THOMAS JOHNSON, Secretary.

## Milwaukee Branch

HEADQUARTERS, CARE OF JOHN N. HOCK, 1229 WEST 24TH STREET, MILWAUKEE, WISCONSIN

### Annual Banquet and Session April 26

The Milwaukee Branch of the American Electroplaters' Society will hold its annual banquet and educational session at the New Schroeder Hotel, Milwaukee, Saturday, April 26, 1930.

President Edward Werner has appointed the following committee to make all arrangements: Robert Steuernagel, chairman; Henry Hurtig, Frank Marx, Henry Binder, Jack Geisman, Joseph Bykowski, Nicholas DeCesare, H. C. Jeger, Arthur Koehler, Daniel Wittig, Ray Goodsell, Marty Nischwitz and Herman Peterson.

There will be a good program of papers which will be announced later.

D. W.

## Newark Branch

HEADQUARTERS, CARE OF GEORGE REUTER, BOX 201, NEWARK, N. J.

### Meetings and Other Activities

Regular meeting of the Newark Branch, American Electroplaters' Society, was held Friday, January 3, at Franklin Hall, 41 Franklin Street, Newark, the regular meeting place, Vice-president Calberbisi presiding.

Edward Homan spoke on "Lacquers of Today," discussing composition, manufacture and application of lacquers to various metals and metal products. He covered wearing qualities and other aspects of the subject, giving a highly instructive lecture. Many questions were asked and Mr. Homan displayed a very wide knowledge of the subject.

### Motion Pictures

Friday evening, January 17, the Branch had motion pictures. "The Story of Brass" and "The Story of the Storage Battery" were projected, as well as two short comedies which were put on

by a member of the Branch. All the pictures were very fine and much appreciated by those present.

The Branch had as guests a delegation from the New York Branch, including President Haushalter, Past-president MacStoker and others. George B. Hogaboom of Hanson-Van Winkle-Munning Company, who is an associate editor of THE METAL INDUSTRY, and Victor Levitt, of the same journal, were also present. There were short speeches by Mr. Haushalter and Mr. MacStoker, who urged the Newark men to attend the New York banquet on February 15. They were promised a good Newark delegation.

**Future Meetings**

On February 21 the Branch will hear a lecture by Mr. Ohl on "The Story of the Silver Deposit," a complete exposition of silver plating.

At the March 7th meeting, the chief event will be a lecture on "Aluminum Plating," by Dr. C. L. Mantell, of Pratt Institute, Brooklyn, N. Y., who will tell about deposition of this metal.

—GEORGE REUTER, Secretary.

## Associated Brass Founders

HEADQUARTERS, CARE OF J. A. DUNCAN, 166 LIVERPOOL STREET, EAST BOSTON, MASS.

**Trade Customs Adopted**

A set of uniform trade customs devised to remove certain causes of dispute between members of the Associated Brass Founders of New England and their customers was adopted by the association recently. There are four classifications of trade customs: estimating, patterns, castings and general, these being covered as in the following abstract:

**Estimating:** Rough casting weight, estimated or exact, to be marked on blueprints submitted; quantity, quality and metal specificatons to be clearly stated; complete pattern equipment to be shown if patterns have been made.

**Patterns:** Customer to supply all patterns or pattern equipment necessary for economical production and delivery of castings; or to be supplied at customer's expense; properly marked for identification. Customer to be responsible for correctness of patterns, core boxes and pattern equipment or any changes therein. Foundry not to be responsible for loss of or damage to patterns by fire or other causes beyond foundry's control.

**Castings:** Foundry to replace defective castings if reported within a reasonable time, with full credit allowed for piece or casting according to weight of material returned. No claims to be allowed by foundry for machine work, labor or expense of any kind in defective castings. Claims for errors in weight or number of castings delivered to be made promptly upon receipt.

**General:** Castings, cores or molds discarded due to cancellations or changes in pattern equipment to be charged to customer. Unless otherwise agreed, all castings to be sold as rough, f. o. b. foundry, weight to be to nearest quarter-pound. Minimum charge on transient work, $1. Charge to be made for special service to secure unusual deliveries.

## International Fellowship Club

HEADQUARTERS, CARE OF T. A. TRUMBOUR, BOX 183, WALL STREET STATION, NEW YORK CITY

**Annual Luncheon at New York**

The International Fellowship Club, following its usual custom, will hold its annual New York luncheon at the Aldine Club, 200 Fifth Avenue, New York City, on February 15, 1930, the day of the annual educational session and banquet of the New York Branch of the American Electroplaters' Society. The luncheon will take place from 1.30 to 3.00 p. m. in a private room.

The principal speaker at this luncheon will be William B. Price, chief chemist and metallurgist of the Scovill Manufacturing Company, Waterbury, Conn. He will speak on "Co-operation of the Technical Department with the Sales Department," the address to be illustrated with twenty-eight lantern slides. Mr. Price will outline the work of the technical department, its opporunities for aiding the sales divisions, and recount some experiences where co-operation between the two has resulted in benefits to both buyers and sellers.

**Chicago Luncheon**

The Club held its annual Chicago luncheon on January 18, with about seventeen present. The speakers were Oliver J. Prentice of the C. A. Dunham Company, Chicago, who discussed various phases of comradeship, fellowship, salesmanship, etc., under the general title "Ships," and J. P. Sanger, purchasing agent, U. S. Gypsum Company, whose subject was "The Relationship of the Purchasing Agent to the Seller."

## Metal Findings Manufacturers

HEADQUARTERS, CARE OF H. R. BARKER, FULFORD MANUFACTURING COMPANY, PROVIDENCE, RHODE ISLAND

The January meeting of the **Metal Finding Manufacturers' Association** was held in the rooms of the **New England Manufacturing Jewelers' and Silversmiths' Association**, in the Providence-Biltmore Hotel, Providence, R. I., on Wednesday, January 8. Those present at the meeting included **Frederick A. Ballou**, of B. A. Ballou and Company, Inc.; **E. E. Baker** of the W. R. Cobb Company; **Harold R. Barker** of the Fulford Manufacturing Company; **F. G. Perry** of the George H. Fuller and Son Company of Pawtucket; **C. W. Keil** of Guyot Bros., Inc., Attleboro; **Frank E. Farnham** of the Jewelers' Supply Company; **William Whytock**, of Roland and Whytock; **William M. Simmons** of the Josiah Walsham Company; and **A. E. Waller**, of the A. E. Waller Company. Minor changes in the by-laws were adapted and a code of ethics was read by Mr. Barker, the secretary, a typewritten copy of which has been furnished every member of the association. A vote upon the matter will be taken at the February meeting. Frederick A. Ballou, chairman of the Credit Committee, reported progress and stated that a final report will be made at the next meeting. A very large proportion of eastern findings manufacturers are members of the organization and a campaign is being conducted to enroll such concerns as are not already members. Mr. Farnham, president of the association, expressed confidence that business in general was improving, and this opinion was coincided in by the members present. —W. H., M.

# Motor Boat Show

The 25th Annual Motor Boat Show was held in Grand Central Palace, January 17-25 under the auspices of the National Association of Engine and Boat Manufacturers, Inc.

To us, the outstanding feature of this Show was the quantity and importance of the metals used in the construction of motor boats. In such standard lines as fittings and hardware, of course, brass and bronze were predominant. In the outboard motor field, aluminum stood out above all other metals. In the large engines, metals took their place at special points of importance, leaving the heavier construction to iron and steel.

A number of metal and metal product manufacturers exhibited at the Show, among whom were the following:

American Brass Company, Waterbury, Conn.
Baltimore Copper Paint Company, Baltimore, Md.
Colombian Bronze Corporation, Freeport, N. Y.
Duriron Company, Inc., Dayton, Ohio.
Hyde Windlass Company, Bath, Maine.
International Nickel Company, New York.
McCord Radiator and Manufacturing Company, Detroit, Mich.
M. L. Oberdorfer Brass Company, Syracuse, N. Y.
Pyrene Manufacturing Company, Newark, N. J.
Sperry Gyroscope Company, Inc., Brooklyn, N. Y.
Waterbury Clock Company, Waterbury, Conn.

# Personals

## Dr. Samuel L. Hoyt

Dr. S. L. Hoyt, of the Research Laboratory of the General Electric Company, in Schenectady, N. Y., will deliver the annual lecture at the Institute of Metals Division at the meeting on February 19, 1930. He will speak on "Hard Metal Carbides and Cemented Tungsten Carbide."

Dr. Hoyt was born in Minneapolis, May 29, 1888. He was graduated with the degree of E. M. from the University of Minnesota in 1909, and was awarded his Doctor's degree at Columbia University in 1914, after he had attended the Charlottenburg Technical School in Germany from 1911 to 1913.

Dr. Samuel L. Hoyt

Dr. Hoyt has had a distinguished career as a metallurgist. He was on the faculty of the University of Minnesota from 1913 to 1919, at first as assistant professor of metallography and then as associate professor of metallography. He then went to the National Lamp Works of the General Electric Company in Cleveland as a metallurgical engineer in the Experimental Engineering Laboratory, where he remained until 1922. In 1922 he moved to Schenectady, continuing his work as a metallurgical engineer with the General Electric Company. He has been a special investigator for the Bureau of Mines and the National Research Council on the use of manganese alloys in steel-making practice. He has published a number of articles and technical papers on his researches. He is author of "Principles of Metallography," "The Metals and Common Alloys," and "Metallography" (McGraw-Hill Book Company).

Dr. Hoyt is a member of the American Institute of Mining and Metallurgical Engineers, the American Society for Steel Treating, The British Iron and Steel Institute, and the British Institute of Metals. For the last named Institute he is the corresponding member of the Council for the United States. He is a member of Delta Tau Delta and the Sigma Xi fraternities. He was married to Jane Douglas Woodruff on January 1, 1913, and has three children, Samuel Leslie Jr., Vardaman Hunt and Robert Stuart Hoyt.

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**Sidney Cornell** has spent the last few months at the plant of the Mueller Company of Decatur, Ill., making an engineering survey for the process lineup for their new plant, which, it is said will cost over $1,000,000.

**Crain S. Jordan** has been transferred from the furnace engineering department of The Ferro Enamel Supply Company, Cleveland, Ohio, to its sales department, where he has charge of mill room equipment sales.

**E. O. McFadon** has been placed in charge of porcelain enamel spraying equipment sales for the Ferro Enamel Supply Company, Cleveland, Ohio. He was formerly in charge of the St. Louis district for The Ferro Enamel Supply Company.

**George B. Hogaboom**, of the Hanson-Van Winkle-Munning Company, Matawan, N. J., an associate editor of THE METAL INDUSTRY, will be the principal speaker at a meeting of the Detroit Branch of the American Electroplaters' Society on February 7, 1930, to be held at the Hotel Statler. He will speak on various phases of electroplating technology.

**R. F. Crudington**, formerly works manager of the Elliot-Fisher Company, Harrisburg, Pa., manufacturers of accounting and writing machines, has been transferred to the Bridgeport, Conn., plant of the Underwood Typewriter Company, where he will act in a similar capacity.

**W. H. Bassett**, technical supervisor of the American Brass Company, Waterbury, Conn., on January 27 gave the fourth of a series of lectures on "Recent Progress in Mining and Metallurgy" under the auspices of the Mining and Metallurgy Department, at Columbia University, New York.

**Zay Jeffries**, consulting metallurgist, Cleveland, Ohio, sailed on the Steamship Bremen on January 11, for a brief business trip to Germany. He plans to return about February 17. He will deliver the Howe memorial lecture at the February meeting of the American Institute of Mining and Metallurgical Engineers, February 17 to 21.

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# Obituaries

## Louis Brennan

Louis Brennan, president of the Victor Brass Manufacturing Company, Cleveland, Ohio, died on January 2, 1930, after a brief illness. He was in his fifty-fifth year.

Mr. Brennan had been actively engaged in the manufacture of plumbers' brass goods for the past twenty-five years. For the first few years of this period he was sales representative for the Atlas Brass Company, Cleveland. In 1912, with several other employees of that company, he organized the Victor Brass Manufacturing Company. He was widely known and highly esteemed by his friends and especially his associates.

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## Thomas A. Stevens

Thomas A. Stevens, at one time president and general manager of the Empire Brass and Manufacturing Company, Cleveland, Ohio, died in London, Ontario, Canada, on January 6, 1930. Mr. Stevens was in his eighty-third year.

## Warren P. King

Warren P. King, vice-president of the Aluminum Company of America, and a widely known Cleveland, Ohio, manufacturer and capitalist, died suddenly of a heart attack at Sarasota, Florida, on January 16, 1930.

Mr. King's funeral was held at Cleveland. He is survived by his widow and two sons.

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## Andrew Fiske

Andrew Fiske, president of the Rumford Chemical Works, Providence, R. I., a well-known lawyer of Weston and Boston, Mass., died at Weston on January 26, 1930, in his seventy-seventh year.

Mr. Fiske was a graduate of Phillips Exeter Academy and Harvard University. He had a wide variety of interests besides his presidency of the chemical concern named above, which manufactures metal cleaners. He was a trustee of Wellesley College and for the last ten years was moderator of Weston.

# News of the Industry

## Industrial and Financial Events

### New Metal Exchange Officers

The National Metal Exchange, New York, held its annual election this month, naming Ivan Reitler, first vice president and general manager of the Federated Metals Corporation, to succeed Erwin Vogelsang of Lewis Lazarus and Sons as president.

Other officers were elected as follows: Addison B. Hall of the National Lead Company, first vice-president; C. S. J. Trench of Charles S. Trench and Company, second vice-president; Martin H. Wehncke of Brandeis, Goldschmidt and Company, treasurer.

The members of the Board of Governors were elected as follows: Harold L. Bache of J. S. Bache and Company; J. Chester Cuppia of E. A. Pierce and Company; Kenneth S. Guiterman of Henry Gardner, Guiterman and Company; Francis R. Henderson of F. R. Henderson Corporation; Floyd Y. Keeler of Orvis Brothers and Company; Jerome Lewine of Henry Hentz and Company; Paul Linz of the American Metal Company; Irving J. Louis of E. J. Schwabach Company; George M. Pynchon, Jr., of Pynchon and Company; Leo Lowenstein of the Nassau Smelting and Refining Works and Erwin Vogelsang of Lewis Lazarus and Sons.

### Electrification Expands Use of Copper

The Copper and Brass Research Association reports a steady increase in copper consumption due to electrification of railroads. The report of the survey of electrified railway trackage points out that although less than 1 per cent of the route mileage of American railroads is represented by the mileage now electrified, more than 100,000,000 pounds of copper have been used on these routes. Other definite projects, the survey says, will within a few years double the amount of copper applied to railroad electrification.

The survey also discloses that European railroads have about 6,300 miles electrified.

### Brass Firm on Historic Location

Scovill Manufacturing Company, Waterbury, Conn., has the unique distinction of having its New York office in a historical spot. It is located in the Stewart Building on the east side of Broadway between Chambers and Reade Streets. On the site of this building once stood Washington Hall, famous as a hotel and as the headquarters of the Federals who were opposed to Tammany Hall and the Bread and Cheese Club. Among the members of the Bread and Cheese Club were William Cullen Bryant, Daniel Webster, and Fitz-Greene Halleck. Bread was used as a vote for the admission of members and a bit of cheese was equivalent to a blackball.

### Carnegie Bronze Safety Trophy

The ninth of a series of annual trophies for safety in the plants of the Carnegie Steel Company was placed in competition January 1, 1930. The trophy is of bronze and silver and was made by the Gorham Company, New York. The trophy represents a miniature rolling mill with housings, and a statuette of a steel roller on each side. The base is of bronze and the miniature mill of silver. The rollers were taken from men actually doing this work in Carnegie plants.

### Correction

President Charles E. Beardsley of the Beardsley and Wolcott Manufacturing Company, Waterbury, Conn., wishes to correct a statement appearing in the January METAL INDUSTRY to the effect that the Keeler Brass Company of Grand Rapids, Mich., had purchased the Berbecker and Rowland Company of Waterbury, and that its production would be concentrated in Grand Rapids. The Berbecker and Rowland Co. was bought by Beardsley and Wolcott over a year ago and is still owned by them. All that the latter sold to the Keeler Brass Co. was the manufacture and business of one line of cabinet hardware. The Berbecker and Rowland name is still retained by Beardsley and Wolcott and all its lines except the one line stated. —W. R. B.

### Brass Ingot Statistics

Non-Ferrous Ingot Metal Institute, Chicago, Ill., reports the average prices per pound received by its membership on commercial grades of the six principal mixtures of ingot brass during the twenty-eight day period ending January 3, 1930.

(The following specifications will be understood to refer to "commercial grades.")

| | |
|---|---|
| Commercial 80-10-10 (1% impurities) | 16.524c |
| Commercial 78% metal | 14.879c |
| Commercial 81% metal | 15.136c |
| Commercial 83% metal | 15.305c |
| Commercial 85-5-5-5 | 15.348c |
| Commercial No. 1 yellow brass ingot | 12.313c |

On January 1st, unfilled orders for brass and bronze ingots and billets on the books of the members of the Institute amounted to a total of 9,578 net tons, according to the announcement. The corresponding figure for December 1, 1929, was 10,696 net tons.

### Allied Industrial Products Company

Allied Industrial Products Company, Chicago, Ill., purchased the entire assets, good will, machinery and equipment of the Advance Wheel Manufacturing Company, 622 West Lake Street, Chicago, on January 14, at receivers' sale. The Advance company manufactured the "Diamond" brand polishing wheels, etc., and it has now been consolidated with the Allied organization.

The Allied Industrial company has during the past three years purchased two other companies, the Peters Buff Company and the Chicago Wheel and Manufacturing Company, but manufacturers of polishers' wheels and other polishing supplies and equipment. This policy of expansion has placed the Allied company in a position to supply users of bugs and wheels with any type of these supplies, including cloth and felt wheels, abrasives, compounds, cleaners, a variety of compositions for the porcelain enameling industry, etc.

The headquarters of the company are at 17-19 North Elizabeth Street, Chicago.

### Early American Silver Exhibit

The collection of early American silver belonging to Mr. and Mrs. Francis P. Garvan of New York City has been placed on exhibition in the Yale Gallery of Fine Arts, New Haven, Conn.

The bulk of the silver is of Boston origin. The silversmiths, Benjamin Hiller, Jacob Hurd, John Edwards, Paul Revere and John Dixwell, are represented. Pieces are included from Marblehead, Salem, Concord, Worcester, Deerfield, Newport and New Haven. There is also a large group from New York and Philadelphia.

### Tinware, Galvanized and Japanned Ware

The Division of Simplified Practice, Bureau of Standards, Washington, D. C., has issued a reaffirmation of Simplified Practice Recommendation No. 55, covering tinware, japanned and galvanized ware. This was reaffirmed by the Standing Committee for one year, without change, a survey prior to the revision meeting having shown about 90 per cent adherence to this recommendation among manufacturers and others concerned.

# Business Reports of The Metal Industry Correspondents

## New England States

### Waterbury, Connecticut

FEBRUARY 1, 1930.

Stockholders of the **Scovill Manufacturing Company** at a meeting December 30, unanimously approved the acquisition of **A. Schrader's Son, Inc.**, Brooklyn, N. Y., announced last month. Of the 885,000 shares of stock outstanding, 753,703 were represented at the meeting. The price paid was not disclosed beyond the previous statement that of the $25,000,000 5½ percent debentures issued, "a substantial portion" would be used in making the acquisition. It is understood that the debentures have been given direct in exchange for the Schrader stock rather than marketing them and paying cash for the Schrader stock. The stockholders ratified the issuance of these debentures and also the issuance of 515,000 additional shares of common stock, of which 384,615 will be issued from time to time in conversion for the debentures and 130,385 issued at the discretion of the directors to finance additional acquisitions.

The debentures have a conversion privilege, being convertible the first year into Scovill stock at the price of $65 a share, the second year, $67.50 a share, the third year, $70 a share, the fourth year, $72.50 and thereafter at $75 a share. To protect the conversion privilege it was voted that no stock dividends shall be issued and no stock shall be issued at less than the conversion price until the conversion has been completed.

Some of the Schrader business will be moved here, President **E. O. Goss** of the **Scovill Manufacturing Company** has stated, although the Brooklyn plant will continue to be operated under its present management. Heretofore, while the Schrader concern used Scovill brass to a considerable extent, it also used some from the **American Brass Company.**

Two representatives of the **Kennecott Copper Mining Company** were added to the directorate of the **Chase Companies, Inc.**, at the latter's annual meeting, January 20, but all the former Chase directors and officers were reelected. All the stock is now owned by the Kennecott company. The two Kennecott men added are **E. T. Stannard** and **C. T. Ulrich.** The directors elected are as follows: F. S. Chase, I. H. Chase, A. R. Kimball, R. D. Ely, R. L. Coe, F. A. Jackle, J. R. Van Brunt, Rodney Chase, E. T. Stannard, C. T. Ulrich, C. E. Hart, Jr. The directors reelected the following officers: **President Frederick S. Chase;** vice president, **Irving H. Chase;** secretary, **Robert L. Coe;** treasurer, **Richard D. Ely;** assistant treasurer, **Charles E. Hart, Jr. Robert L. Coe** is general sales manager, **R. D. Ely** is in charge of production of all the mills and plants, and **W. A. Purdy** is controller.

**President John A. Coe** of the **American Brass Company,** last month denied statements of the local assessors that the old **Holmes, Booth and Hayden** plant, a part of the former concern, is now practically vacant. The assessors stated that most of the machinery of the former plant, previously valued in the city tax assessment at $500,000, had been scrapped and only a few of the more modern pieces shipped to other plants of the company. As a result, they declared, most of the former Holmes, Booth and Hayden buildings were empty. President Coe denied this, saying that scarcely any machinery had been scrapped and that the plant is running practically at the same capacity as formerly. The only machinery changes made were such as are normally made every year, he said.

The former **Randolph-Clowes Company** plant is now vacant. **The American Brass Company,** which bought the business and equipment of that plant some months ago, has moved all the machinery to other plants of the latter company. The large hydraulic tube extrusion machine of the Randolph-Clowes plant has been moved to the former Holmes, Booth and Hayden plant of the **American Brass Company.**

**MacDermid, Inc.,** chemical manufacturers of this city, have purchased the plant of the former **Carroll Wire Company,** which went into bankruptcy over a year ago. Over 13,000 square feet of factory space and over an acre of land figured in the transaction. **MacDermid, Inc.,** manufactures potash compounds used in cleaning metals which are to be electroplated with nickel, silver, chromium, etc. The company also supplies plating concerns with chemicals used in the plating processes, consisting of salts of the metals used in the coating, and makes cleaning compounds for use on plated metal. The officers are: President, **Archie MacDermid;** vice-president, **George E. Hopkins;** treasurer, **W. D. MacDermid;** secretary, **C. A. Dinwoodie.**

Development of an airplane embodying novel features is under way at the **Waterbury Button Company** plant. No specific data to describe the new plane is available as yet.

**President Edward O. Goss** of the **Scovill Manufacturing Company,** as one of the directors of the New Haven Railroad, acted as toastmaster at the Chamber of Commerce dinner here last month to **J. J. Pelley,** president of the railroad.

Several mass meetings have been held during the past month under the auspices of the **Trade Union Unity League,** a Communist organization, in an attempt to organize the metal workers of the city. While several signed applications, it is said that the number was so few as to discourage the idea of forming a branch here of the so-called **Metal Workers' League.**

**August M. Brandt,** for the past 18 years connected with the **Chase Companies, Inc.,** has resigned his position to take up other work. He entered the company's employ as draftsman, and has served as superintendent of construction, assistant master mechanic, and chief draftsman.

Among patents granted to Waterbury inventors during the past month were one to **Joseph F. Moran** on a vanity case and one to **Philip Reutter** for a soap-stick holder. Both were assigned to the **Scovill Manufacturing Company.** —W. R. B.

### Connecticut Notes

FEBRUARY 1, 1930.

**NEW BRITAIN**—Properties owned by the **American Hardware Corporation** rank highest in the list of property assessed by the city for taxation this year, the total valuation of its physical property being set at $11,673,025. The three next highest are: Stanley Works, $8,112,300; Landers, Frary and Clark, $6,794,800; North & Judd Manufacturing Co., $2,229,100; Fafnir Bearing Company, $1,666,275; Hart and Hutchinson, $807,350; N. G. Gridley Machine Company, $732,125; Eastern Malleable Iron Company, $677,000; New Britain Machine Company, $288,000; Swift and Upton, $135,100; Union Manufacturing Company, $825,100; Minor and Corbin Company, $77,100; Skinner Chuck Company, $385,000; Beaton and Caldwell Company, $124,750.

**Herbert R. Owen,** vice-president of **Landers, Frary and Clark,** was added to the directorate of the **Commercial Trust Company** at the annual meeting last month. Mr. Owen is sales manager of the aluminum department of the factory as well as vice-president. **Lucius M. Knouse,** president of the **Stanley Electric Tool Company,** the new subsidiary of **Stanley Works,** was also added to the directorate of the trust company.

**TORRINGTON**—For the first time in six years the **Hotchkiss Brothers Manufacturing Company** omitted paying the Christmas bonus to its employes. The recent industrial recession is said to be the cause.

Representatives of The American Brass Company, Dayton Manufacturing Company, Torrington Company, Torrington Manufacturing Company, Fitzgerald Manufacturing Company, Hotchkiss Brothers Company, Hendey Machine Company, Progressive Manufacturing Company, Turner and Seymour Manufacturing Company, Union Hardware Company, and

Schroeder Brothers Company attended the third annual banquet of the **Industrial Foremen's Association** on January 15. The Torrington Company had the largest delegation. The committee in charge was headed by **Andrew G. York** of the American Brass Company.

Atty. Thomas J. Wall has applied for the appointment of a temporary receiver for the Severin Manufacturing Company. The plant is now closed and several creditors have placed attachments on the property.

**MERIDEN**—In the last three months of 1929 the International Silver Company reported earnings in excess of the same period the previous year. The earnings for the nine months ending September 30, amounted to $8.58 a share.

**BRIDGEPORT**—Charles E. Wilson, assistant to Vice President Charles E. Patterson of the General Electric Company, has been named manager of the merchandise department. He succeeds Major H. C. Houck. He was named assistant manager of the Bridgeport works in 1925, and assistant to the vice president in 1928.

**BRISTOL**—The plant of the Birge Manufacturing Company, which has been closed for over a month, will reopen soon with the arrival of James F. Nields of Ware, Mass., who will be the new general manager. The local company employs about 150 hands.

**THOMASTON—The Hallden Machine Company,** makers of automatic sheet-making and tube-making machinery, which has been in business here and in Waterbury since 1917, has been incorporated with a capital of $200,000. **Karl W. Hallden,** founder of the company, is the president and treasurer; **Roger C. Jones,** vice-president and general manager; and **Miss Margaret Maliagan,** secretary and assistant treasurer.

**WALLINGFORD—The S. L. and G. H. Rogers Silver Company,** a branch of the **International Silver Company,** has been closed and the business and equipment moved to other plants of the company. At the close of business, bonuses totalling $15,000 were distributed among 108 employes. Foremen and employes of 20 years' standing received half pay for 12 weeks and employes of between 10 and 19 years' service received 8 weeks half pay while those with from one to nine years' service received half pay for four weeks.

**WINSTED—The Winsted Insulated Wire Company,** which has enjoyed unusually good business since it was started here a few years ago, has increased its capital stock from $50,000 to $100,000.

**HARTFORD**—Directors of **Veeder-Root, Inc.,** have declared a regular quarterly dividend of 62 cents a share, payable February 15, to stock of record January 31. Orders in substantial volume have been coming in since January 1.

**NAUGATUCK—Harris Whittemore, Jr.,** has started an action in the Superior Court for the dissolution of the **Aeronautical Products, Inc.,** of this place. **Clarence S. Austin** has been named receiver of the firm, which stopped work last month. Mr. Whittemore owns 1,170 of the 1,770 shares outstanding. He claims the assets of the firm are in danger of waste. —W. R. B.

## Providence, Rhode Island

FEBRUARY 1, 1930.

The beginning of 1930 found the majority of those associated with the metal trades in this city and vicinity prepared for a continuance of the satisfactory business conditions which had prevailed generally during the preceding twelve months. During 1929 there were more large building projects begun than in several years previous, and, with several others in view, steady employment seems assured in all of the building lines.

In the various lines of jewelry industry, January, as usual, has shown a decided slump, but orders are coming to hand that are very encouraging and the prospects for the year are favorable. The initial orders for the spring delivery have commenced and are of such a character as to warrant satisfactory expectations. Improved general conditions in various metal trades are reflected in greater activity among the tool and machinery producing plants.

**J. C. Brady, Inc.,** electroplaters, have practically doubled their capacity and facilities at 82 Clifford Street, Providence, by securing a large amount of extra floor space through the removal of a former tenant.

A fire in the **Dee Jewelry Company,** manufacturing jewelers, 754 Eddy Street, Providence, on Saturday, January 11, caused damage estimated at $10,000. The origin of the fire was undetermined, but explosions of lacquer and celluloid hampered the firemen in extinguishing the blaze, and a great deal of water was poured into the building. Every window in the shop was blown out by explosions, but the flames did not touch the office of the concern. The loss was covered by insurance and repairs were quickly made and the business continued as usual.

**Arthur C. Ostby,** for fifty years general superintendent and works manager of the **Ostby and Barton Company,** manufacturing jewelers, 118 Richmond Street, retired early this month from active service. Mr. Ostby was born in Norway but came to this country when very young, and most of his life has been devoted to the jewelry industry in Providence. The Ostby and Barton Company was founded by the late **Englehart C. Ostby,** a brother of Arthur Ostby and the late **Nathan B. Barton.** Arthur Ostby engaged with his brother in the early days of the business, having worked previously with **Arnold and Webster** and other old-time manufacturing jewelry concerns. Mr. Ostby went to the Ostby and Barton Company as an engraver and steel worker.

**The Modern Plating Company, Inc.,** has purchased the entire plant and equipment of the **Silver Service Company,** 226 Eddy Street, which will enable that concern which has specialized in chromium, nickel and cadmium plating to do a general plating business, with special facilities for serving the jewelry industry.

**Pease and Curran,** gold, silver and platinum refiners, have moved into the new refinery plant which has been built for them at the corner of Allens Avenue and Chapman Street, from their old location at the corner of Eddy and Point Streets. In the new building are consultation rooms and private offices adjacent to the main office. The entrance to the receiving department for all waste material to be refined is on Chapman Street. The furnaces are of special construction, each being a unit in itself. The arrangement of the assay room and the laboratory is planned so as to minimize the necessary work. The new refinery plant represents the growth of the firm's business since 1916, when it was begun at 403 Richmond Street. At the present time, scrap from 28 lines of business independent of the jewelry line is being refined by the concern.

**Justice Willard B. Tanner** in Superior Court has entered a final decree approving and allowing the final report of the permanent receiver of the **General Sheet Metal Works** and dissolving the corporation.

**Louis D. Spence** of the **Brown and Sharpe Manufacturing Company** spoke on the "Modern Trend of Design and Use of Automatic Screw Machines and Equipment in the United States and Europe," at a joint meeting of the design and drafting sections of the **Providence Engineering Society** on January 28.

**H. J. Astle and Company** are very busy in all departments, with encouraging future bookings. They have recently installed in a large Brooklyn factory several of their latest style polishing machines. The concern is supplying a great many of its new style metal dryers to various brass factories in Connecticut.

The new refining building of **Pease and Curran,** which is being constructed on Allens Avenue, is nearly completed and the company is preparing to remove the plant from its present location on Point Street and occupy the new quarters early in the new year.

**The United Manufacturing Company** of Providence has been incorporated under the laws of Rhode Island to conduct a manufacturing jewelry business with an authorized capital of 100 shares of common stock of no par value. The incorporators are **Ernesto Curtis, Angelo DiMaria** and **Leonardo Martino,** all of Providence.

**The Realart Fittings Company** has been incorporated by **Frederick M. Swartz, Solomon Mondlick** and **Evelyn Mondlick,** all of Cranston, and under the laws of Rhode Island will manufacture metal specialties in Providence. The company is capitalized with $25,000 in preferred stock and 75 shares of common stock without par value. —W. H. M.

# Middle Atlantic States

## Newark, New Jersey

FEBRUARY 1, 1930.

Some of the Newark metal concerns report business as being fairly good, while others say there has been a falling off in orders and that the situation is not very good. However, manufacturers believe that business will pick up in the spring.

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**Vice-chancellor Backes** has imposed a fine of $100 upon the **Chemical Company of America,** whom he found guilty of contempt of an injunction retraining it from operating its plant at Springfield, Union County, and polluting a tributary of the Rahway River. The contempt proceedings were brought in 1927 at the instigation of the State Board of Health. A restraint order was first issued in 1917 by Vice-chancellor Backes but was subsequently lifted when the plant obtained an invention which purified the waste material and temporarily eliminated pollution.

Affairs of the **Earl Radio Corporation** are to be left to the jurisdiction of the Chancery Court receivers, **Harry G. Hendricks** and **Oscar A. Klamer. Federal Judge Runyon** had vacated a restraining order against the two receivers, who were enjoined by him in December from selling and delivering any radio sets of the concern. A motion to appoint Federal Court receivers was denied. In vacating the restraint, Judge Runyon said that when he granted it he understood the Earl Corporation desired Federal Court jurisdiction. But in the answer filed by the corporation, he said, insolvency was denied, and he felt the matter should be left where it was. Involuntary bankruptcy proceedings were filed against the corporation early in December.

The following Newark corporations have been chartered: **Hansa Chemical Laboratory,** chemicals, capital $100,000; **Radio King Tube Corporation,** radio tubes, 500 shares no par; **Solvoid Company,** manufacture chemicals, $100,000.

—C. A. L.

## Trenton, New Jersey

FEBRUARY 1, 1930.

Trenton metal manufacturers complain that business is not very good at the present time and are looking for conditions to improve before spring.

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**Fred A. Barton** and **Willard Hammond,** proprietors of the **Trenton Emblem Company,** 120 Hamilton Avenue, Trenton, recently purchased the plant of the **Woodhouse Chain Works** at Edgely, Pa. The company has the plant modernly equipped, but report that business has fallen of considerably.

**The Triangle Conduit Company, Inc.,** Brooklyn, N. Y., has instituted suit in the United States District Court at Trenton against the **Crescent Armored Wire Company,** alleging infringment of its patent on a machine making metallic conduits. The plaintiff concern asks the court to have the Trenton firm make an accounting of all profits derived from use of the patent and turn over the sum to the petitioner, along with three times that total as alleged damages, as well as to pay court costs. It is charged that the Trenton company was notified to desist from alleged use of the patent and refused to do so.

A similar suit was filed in the same court by **Frank S. Hodson,** of Philadelphia, against the **New Jersey Zinc Company,** whose main office is in New York City. The patent in this case covers improvements in the manufacture of metallic alloys, sought on October 7, 1920, and granted on June 2, 1925. The court is asked to have the defendant firm account for all profits from alleged use of patent.

The following concerns have been incorporated at Trenton: **Eureka Metal Refinishing Company,** metals, $50,000, Hillside; **National Products Corporation,** metal products, 1,000 shares, Glen Ridge; **Viclaire, Inc.,** chemicals, 1,000 shares, Englewood; **Hudson Foundry Company, Inc.,** operate foundry, 1,000 shares, Harrison; **Acorn Industries, Inc.,** manufacture solderless battery terminals, 2,500 shares, Moorestown.—C. A. L.

# Middle Western States

## Cleveland, Ohio

FEBRUARY, 1. 1930.

**Thompson Products, Inc.,** has received release orders on 200,000 valves for the Chrysler and Oakland motor car companies. In addition to these releases, inquiries also have been received from the **American Austin Car Company** and **Continental Motors** for valves in lots of 300,000 and 200,000, respectively.

—F. J. H.

## Toledo, Ohio

FEBRUARY, 1. 1930.

General business in Toledo is showing moderate signs of improvement, although it might be a great deal better. The plating industry seems to be on the upward trend, with favorable future prospects. Although plants producing motor car supplies are still lagging, nearly every one is optimistic for the future. It is realized, nevertheless, that production will be more or less curtailed all through the year. It is expected this will result in a general equalization of the industry, with production more steady.

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**Linwood A. Miller,** president of the **Willys-Overland Company** here, estimates the motor output in the United States and Canada this year will range from 4,600,000 to 5,000,000 units, but is inclined to believe the lower figure will be established. Keeping production within retail demand, he thinks, should result in a moderate upward trend in automobile prices. The Overland production for this year he estimates at about 275,000 units, including exports, against 314,000 last year.

Increasing output of Model-A Ford cars during the past year created a growing demand for accessories. Toward the end of 1929 the consumption of spark plugs alone required regular shipment of more than six tons a day, which were transported by truck from the Toledo plant of the **Champion Spark Plug Company,** which has furnished spark plugs for the standard equipment of Ford cars for 17 years.

**The Electric Auto-Lite Company** is completing a $1,000,000 plant addition for the manufacture of the entire electrical equipment for the **Ford Motor Company,** Detroit. On a basis of 2,000,000 production for Ford in 1930, Auto-Lite would ship 2,000,000 there alone. Placing the Hudson, Willys-Overland, Nash, Hupp and Durant requirements at only 750,000 machines, would give the Ohio accessory maker a volume of 2,750,000 starting-lighting systems, or an increase over 1929 of almost 20 per cent. **C. O. Miniger,** president of the Electric Auto-Lite Company, was recently elected president of the **Electric Auto-Lite of Canada, Ltd.,** which recently opened a new plant at Sarnia, Ont.

—F. J. H.

## Detroit, Michigan

FEBRUARY 1, 1930.

General business conditions in this area continue about as they were a month ago. There may be some slight improvement in the non-ferrous field, but it is not very pronounced. However, there is more optimism expressed than a few weeks ago. It is a little early in the year to make much of a fore-

cast, considering the uncertainty in other lines of industry.

The motor car industry, on which so much depends in this section is still sagging, although manufacturers are expecting a revival in the immediate future. However, every one anticipates a decided curtailment of production all through the year, and that, of course, is going to be felt in the manufacturing of supplies.

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**The Grand Rapids Brass Company,** Grand Rapids, reports about the same number of orders on hand as it had a year ago. Its executives regard prospects good for new business during the first half of the year. During these months the company will be in the market for lead, brass, zinc, copper and other supplies, it is stated.

**The United Brass and Aluminum Company,** Port Huron, has, according to report, about the same number of orders ahead now as a year ago. During the coming months it will be in the market for aluminum, brass, non-ferrous scrap and other supplies, it is stated.

**The Campbell, Wyant and Cannon Foundry Company,** Muskegon, Mich., has about the same number of orders ahead as a year ago, it is stated, and executives regard prospects for new business during the first half of the year as fair.

At the recent annual meeting of stockholders of the **Mueller Brass Company,** Port Huron, it was announced that the company had just completed the biggest year in its history, with a total business of more than $7,000,000. Prospects for the new year, it was stated, are good, with over a million dollars in orders now on the books.

**The Hancock Manufacturing Company,** Jackson, Mich., manufacturers of automobile door hardware, is optimistic regarding business prospects for the first half of 1930. Orders ahead at present, as compared with January 1 of 1929, are about 50 per cent. During the next six months, it is stated, the company will be in the market for brass, lead, brass castings, copper and other materials.

**The Detroit Plating Company** considers prospects good for new business during the next six months. During the first half of the year the company will be in the market for brass, zinc and copper.

**The Pemberthy Injector Company,** Detroit, reports an expectation of normal business during the first six months of the present year. During this period the company will be in the market for raw materials, including copper.

**The General Chromium Company,** Detroit, expects to operate at about 50 per cent of capacity during the first six months of 1930, it is reported in quarters close to the firm.

**The American Injector Company,** according to a recent statement, expects new business during the next six months to come within ten per cent of the business during the first half of 1929. During the coming months the company will be in the market for lead, brass, zinc and copper.

Science has made another contribution to the automotive industry, a new alloy for spark plug electrodes that requires 50 per cent less voltage to produce a spark; assures constant sparking voltage for the life of the plug; and permits easier starting in cold weather. This new alloy was developed some time ago by **Hector Rabezzana** and **D. W. Randolph,** engineers of the **AC Spark Plug Company,** Flint, Mich.

**The American Brass and Iron Company,** Detroit, reports about 50 per cent more orders on hand than at this time a year ago. The company expects to do more business during the first and second quarters of 1930 than during the corresponding periods a year ago. During these months the company will be in the market for brass, zinc, copper and other raw materials, it is stated.

**The Michigan Valve and Foundry Company,** Detroit, recently received an extensive order from the city of Detroit and has other work that is keeping its plant extremely busy. Executives regard the outlook for 1930 as very favorable. During the next six months the company will be in the market for lead, brass, copper and other materials.

**The Superior Brass Works,** Detroit, it is stated, has about 40 per cent more orders ahead than it had at this time a year ago. During the next six months the company will be in the market for brass and also non-ferrous scrap metal.

**The Acme Smelting and Refining Company,** 648 East Columbia Street, Detroit, was recently incorporated. The capital stock is $20,000. As the name implies, this company is engaged in a general smelting and refining business.

**The Gale Manufacturing Company,** Albion, Mich., is anticipating a substantial volume of new business during the first six months of 1930, it is said. During this period the company will be in the market for aluminum and other materials, it is reported.

**The Kuhlman Electric Company,** Bay City, Mich., has about the same number of orders ahead at the present time as it had a year ago. Prospects for new business during the first half of the year are considered good.

**The Welding Equipment and Supply Company,** with offices at 2232 Buhl building, Detroit, was recently incorporated.

—F. J. H.

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# Other Countries

## Birmingham, England

JANUARY 20, 1930.

**The year has opened** quietly for the non-ferrous metal industries of Birmingham. There is a good deal of uncertainty regarding the policy of the Labor Government and there has been a good deal less talk about an increase in prosperity than there was at the beginning of last year and the year before. During the past twelve months the uncertainty of the copper market has been against heavy purchases, and brass and copper manufacturers all speak of hand to mouth buying. There has not been enough work to go round in the brass trade, so that some firms have done well and others have only managed a moderate turnover. With a view to reducing production costs the manufacturers have resorted more and more to mass production methods and standardization. That section of the industry producing sheet, strip, tubes, wire, etc., were hampered in the Spring by shortage of copper and high prices.

**In regard to overseas business** a falling off in the exports of brass sheets and strip was more than made up by increased shipments of wire and various other manufactures. There was a greatly increased sale overseas of copper in the primary stages of manufacture and a less pronounced increase in export of plates, rods, wire, tubes, etc. The most noteworthy development in works practice was the advance of the electric melting furnace.

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# Middle Atlantic States

## Newark, New Jersey

FEBRUARY 1, 1930.

Some of the Newark metal concerns report business as being fairly good, while others say there has been a falling off in orders and that the situation is not very good. However, manufacturers believe that business will pick up in the spring.

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**Vice-chancellor Backes** has imposed a fine of $100 upon the **Chemical Company of America,** whom he found guilty of contempt of an injunction retraining it from operating its plant at Springfield, Union County, and polluting a tributary of the Rahway River. The contempt proceedings were brought in 1927 at the instigation of the State Board of Health. A restraint order was first issued in 1917 by Vice-chancellor Backes but was subsequently lifted when the plant obtained an invention which purified the waste material and temporarily eliminated pollution.

Affairs of the **Earl Radio Corporation** are to be left to the jurisdiction of the Chancery Court receivers, **Harry G. Hendricks** and **Oscar A. Klamer. Federal Judge Runyon** had vacated a restraining order against the two receivers, who were enjoined by him in December from selling and delivering any radio sets of the concern. A motion to appoint Federal Court receivers was denied. In vacating the restraint, Judge Runyon said that when he granted it he understood the Earl Corporation desired Federal Court jurisdiction. But in the answer filed by the corporation, he said, insolvency was denied, and he felt the matter should be left where it was. Involuntary bankruptcy proceedings were filed against the corporation early in December.

The following Newark corporations have been chartered: **Hansa Chemical Laboratory,** chemicals, capital $100,000; **Radio King Tube Corporation,** radio tubes, 500 shares no par; **Solvoid Company,** manufacture chemicals, $100,000.

—C. A. L.

## Trenton, New Jersey

FEBRUARY 1, 1930.

Trenton metal manufacturers complain that business is not very good at the present time and are looking for conditions to improve before spring.

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**Fred A. Barton** and **Willard Hammond,** proprietors of the **Trenton Emblem Company,** 120 Hamilton Avenue, Trenton, recently purchased the plant of the **Woodhouse Chain Works** at Edgely, Pa. The company has the plant modernly equipped, but report that business has fallen of considerably.

**The Triangle Conduit Company, Inc.,** Brooklyn, N. Y., has instituted suit in the United States District Court at Trenton against the **Crescent Armored Wire Company,** alleging infringment of its patent on a machine making metallic conduits. The plaintiff concern asks the court to have the Trenton firm make an accounting of all profits derived from use of the patent and turn over the sum to the petitioner, along with three times that total as alleged damages, as well as to pay court costs. It is charged that the Trenton company was notified to desist from alleged use of the patent and refused to do so.

A similar suit was filed in the same court by **Frank S. Hodson,** of Philadelphia, against the **New Jersey Zinc Company,** whose main office is in New York City. The patent in this case covers improvements in the manufacture of metallic alloys, sought on October 7, 1920, and granted on June 2, 1925. The court is asked to have the defendant firm account for all profits from alleged use of patent.

The following concerns have been incorporated at Trenton: **Eureka Metal Refinishing Company,** metals, $50,000, Hillside; **National Products Corporation,** metal products, 1,000 shares, Glen Ridge; **Viclaire, Inc.,** chemicals, 1,000 shares, Englewood; **Hudson Foundry Company, Inc.,** operate foundry, 1,000 shares, Harrison; **Acorn Industries, Inc.,** manufacture solderless battery terminals, 2,500 shares, Moorestown.—C. A. L.

# Middle Western States

## Cleveland, Ohio

FEBRUARY, 1. 1930.

**Thompson Products, Inc.,** has received release orders on 200,000 valves for the Chrysler and Oakland motor car companies. In addition to these releases, inquiries also have been received from the **American Austin Car Company** and **Continental Motors** for valves in lots of 300,000 and 200,000, respectively.

—F. J. H.

## Toledo, Ohio

FEBRUARY, 1. 1930.

General business in Toledo is showing moderate signs of improvement, although it might be a great deal better. The plating industry seems to be on the upward trend, with favorable future prospects. Although plants producing motor car supplies are still lagging, nearly every one is optimistic for the future. It is realized, nevertheless, that production will be more or less curtailed all through the year. It is expected this will result in a general equalization of the industry, with production more steady.

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**Linwood A. Miller,** president of the **Willys-Overland Company** here, estimates the motor output in the United States and Canada this year will range from 4,600,000 to 5,000,000 units, but is inclined to believe the lower figure will be established. Keeping production within retail demand, he thinks, should result in a moderate upward trend in automobile prices. The Overland production for this year he estimates at about 275,000 units, including exports, against 314,000 last year.

Increasing output of Model-A Ford cars during the past year created a growing demand for accessories. Toward the end of 1929 the consumption of spark plugs alone required regular shipment of more than six tons a day, which were transported by truck from the Toledo plant of the **Champion Spark Plug Company,** which has furnished spark plugs for the standard equipment of Ford cars for 17 years.

**The Electric Auto-Lite Company** is completing a $1,000,000 plant addition for the manufacture of the entire electrical equipment for the **Ford Motor Company,** Detroit. On a basis of 2,000,000 production for Ford in 1930, Auto-Lite would ship 2,000,000 there alone. Placing the Hudson, Willys-Overland, Nash, Hupp and Durant requirements at only 750,000 machines, would give the Ohio accessory maker a volume of 2,750,000 starting-lighting systems, or an increase over 1929 of almost 20 per cent. **C. O. Miniger,** president of the Electric Auto-Lite Company, was recently elected president of the **Electric Auto-Lite of Canada, Ltd.,** which recently opened a new plant at Sarnia, Ont.

—F. J. H.

## Detroit, Michigan

FEBRUARY 1, 1930.

General business conditions in this area continue about as they were a month ago. There may be some slight improvement in the non-ferrous field, but it is not very pronounced. However, there is more optimism expressed than a few weeks ago. It is a little early in the year to make much of a fore-

cast, considering the uncertainty in other lines of industry. The motor car industry, on which so much depends in this section is still sagging, although manufacturers are expecting a revival in the immediate future. However, every one anticipates a decided curtailment of production all through the year, and that, of course, is going to be felt in the manufacturing of supplies.

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**The Grand Rapids Brass Company,** Grand Rapids, reports about the same number of orders on hand as it had a year ago. Its executives regard prospects good for new business during the first half of the year. During these months the company will be in the market for lead, brass, zinc, copper and other supplies, it is stated.

**The United Brass and Aluminum Company,** Port Huron, has, according to report, about the same number of orders ahead now as a year ago. During the coming months it will be in the market for aluminum, brass, non-ferrous scrap and other supplies, it is stated.

**The Campbell, Wyant and Cannon Foundry Company,** Muskegon, Mich., has about the same number of orders ahead as a year ago, it is stated, and executives regard prospects for new business during the first half of the year as fair.

At the recent annual meeting of stockholders of the **Mueller Brass Company,** Port Huron, it was announced that the company had just completed the biggest year in its history, with a total business of more than $7,000,000. Prospects for the new year, it was stated, are good, with over a million dollars in orders now on the books.

**The Hancock Manufacturing Company,** Jackson, Mich., manufacturers of automobile door hardware, is optimistic regarding business prospects for the first half of 1930. Orders ahead at present, as compared with January 1 of 1929, are about 50 per cent. During the next six months, it is stated, the company will be in the market for brass, lead, brass castings, copper and other materials.

**The Detroit Plating Company** considers prospects good for new business during the next six months. During the first half of the year the company will be in the market for brass, zinc and copper.

**The Pemberthy Injector Company,** Detroit, reports an expectation of normal business during the first six months of the present year. During this period the company will be in the market for raw materials, including copper.

**The General Chromium Company,** Detroit, expects to operate at about 50 per cent of capacity during the first six months of 1930, it is reported in quarters close to the firm.

**The American Injector Company,** according to a recent statement, expects new business during the next six months to come within ten per cent of the business during the first half of 1929. During the coming months the company will be in the market for lead, brass, zinc and copper.

Science has made another contribution to the automotive industry, a new alloy for spark plug electrodes that requires 50 per cent less voltage to produce a spark; assures constant sparking voltage for the life of the plug; and permits easier starting in cold weather. This new alloy was developed some time ago by **Hector Rabezzana** and **D. W. Randolph,** engineers of the **AC Spark Plug Company,** Flint, Mich.

**The American Brass and Iron Company,** Detroit, reports about 50 per cent more orders on hand than at this time a year ago. The company expects to do more business during the first and second quarters of 1930 than during the corresponding periods a year ago. During these months the company will be in the market for brass, zinc, copper and other raw materials, it is stated.

**The Michigan Valve and Foundry Company,** Detroit, recently received an extensive order from the city of Detroit and has other work that is keeping its plant extremely busy. Executives regard the outlook for 1930 as very favorable. During the next six months the company will be in the market for lead, brass, copper and other materials.

**The Superior Brass Works,** Detroit, it is stated, has about 40 per cent more orders ahead than it had at this time a year ago. During the next six months the company will be in the market for brass and also non-ferrous scrap metal.

**The Acme Smelting and Refining Company,** 648 East Columbia Street, Detroit, was recently incorporated. The capital stock is $20,000. As the name implies, this company is engaged in a general smelting and refining business.

**The Gale Manufacturing Company,** Albion, Mich., is anticipating a substantial volume of new business during the first six months of 1930, it is said. During this period the company will be in the market for aluminum and other materials, it is reported.

**The Kuhlman Electric Company,** Bay City, Mich., has about the same number of orders ahead at the present time as it had a year ago. Prospects for new business during the first half of the year are considered good.

**The Welding Equipment and Supply Company,** with offices at 2232 Buhl building, Detroit, was recently incorporated.

—F. J. H.

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# Other Countries

## Birmingham, England

JANUARY 20, 1930.

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manship of British workers. **The Birmingham Chamber of Commerce,** which is entirely responsible for the organization of the Fair, has taken every possible step to ensure success and to attract a record number of buyers from home and abroad. The work of the Chamber of Commerce in the interests of exhibitors does not begin and end with the Fair. The Chamber has a special department permanently through which it endeavors to bring buyers and sellers in touch from one year's end to the other. Inquiries from visiting buyers will be heartly welcomed and immediately attended to either at the headquarters of the Chamber, 95 New Street, Birmingham, or at the Chamber of Commerce Bureau which is conveniently situated near the center of the exhibition building.

—J. A. H.

# Business Items—Verified

**Hayes Body Corporation,** Grand Rapids, Mich., has for the present held up its plans for a one-story addition, 175 x 565 ft., for stamping metal bodies.

**Milwaukee Flush Valve Company,** 125 Reservoir Avenue, Milwaukee, Wis., will build an addition, 25 x 80 ft., for shipping and storeroom purposes.

**National Electric Products Company,** 14th Street, Ambridge, Pa., has completed a one-story, 125 x 180 ft., manufacturing plant at 14th and Duss Streets.

**Pheoll Manufacturing Company,** Chicago, Ill., maker of machine screw products, has temporarily suspended plans for an addition, 80 x 300 ft., three stories and basement.

**Dings Magnetic Separator Company,** Milwaukee, Wis., has named **G. A. Reinhard,** 1836 Euclid Avenue, Cleveland, Ohio, the Cleveland district representative for Dings products.

**Carborundum Company,** Niagara Falls, N. Y., has awarded contract for an addition to kiln building No. 32 on Buffalo Avenue, to be used for manufacturing abrasives. Estimated cost $45,000.

**Fyr-Fyter Company,** 221 Crane Street, Dayton, Ohio, manufacturer of fire extinguishers, is considering erection of a three-story addition, to cost over $85,000 with machinery, for which plans are ready.

**The Samson-United Corporation,** Rochester, N. Y., manufacturer of stainless steel kitchen tools, stainless steel cutlery and electrical appliances, announces the appointment of **B. S. Mitchell** as advertising manager.

**Berry Electric Service Company,** Newark, N. J., manufacturer of electrical supplies, with vacuum cleaner repair division, etc., has leased a building at 43 William Street, totaling 6,000 sq. ft. floor space, for a new plant.

**Michigan Tank and Galvanizing Company,** Detroit, Mich., has held up its plans for construction of a factory for the manufacture of automobile tanks, water tanks, etc., on Fireman Avenue, according to **J. J. Cheviron,** president.

**Williams Chemical Laboratory,** manufacturing chemists, 253 King Street, Charleston, S. C., plans to install a small electroplating plant shortly and is interested in receiving information as to equipment and supplies. **J. J. Williams** is in charge.

**Accural Metal Products Company,** Terminal Tower Building, Cleveland, Ohio, has changed its name to **Chandler Products Corporation,** and has plans for a one-story plant, 95 x 200 ft., to cost about $200,000 with equipment. Firm makes cap screws and studs.

Sixty-six employees of the **American Lead Company,** Indianapolis, Ind., recently joined with their employers in acquiring group life insurance protection through a policy issued by the Prudential Insurance Company of America. The total amount of the policy involved is $66,000.

**Hastings Manufacturing Company,** Hastings, Mich., manufacturer of piston rings and other automotive equipment, has put into service its newly erected one-story addition, 65 x 320 ft., which cost about $70,000 with equipment. Part of unit will be used for inspection and distributing service.

**American Art Metal Works, Inc.,** Detroit, Mich., has been incorporated to manufacture and deal in die castings, tools and automobile hardware, by **John Hartman,** 5032 Twenty-third Street, Detroit. Company operates tool room, casting shop, stamping, plating, polishing and lacquering departments.

**Milwaukee Die Casting Company,** 296 Fourth Street, Milwaukee, Wis., has purchased a 4-acre tract of land in an industrial district along Holton Street, but is not ready to announce plans for new construction. Company operates bronze sand foundry and aluminum die-casting division, brass machine shop, tool room, etc. **Henry F. Schroeder** is president.

**Mason Regulator Company,** Boston, Mass., announces the appointment of the O'Brien Equipment Company, 2726 Locust Boulevard, St. Louis, Mo., as exclusive distributors in the Missouri territory. Latter company will carry a complete stock of Mason products including pressure regulators, damper regulators, balanced valves and reducing valves.

**William Dixon, Inc.,** 32 Kinney Street, Newark, N. J., manufacturers and importers of tools and supplies for jewelers, opticians, engravers, silversmiths, metalworkers, etc., has purchased the business of the **Worthray Supply Company,** 3 Park Place, New York. The acquired company succeeded the tool and supply business of **Worthington and Raymond, Inc.,** established 26 years ago.

**Lydon Brothers, Inc.,** recently organized, is manufacturing industrial ovens for japanning, enameling, core baking, tempering, annealing and glass decoration, at its plant, 229 Colden Street, Jersey City, N. J. **T. Lydon** heads the company. He was formerly general manager of **E. E. Steiner and Company,** Newark, N. J., for whom he had also been in charge of sales, engineering and construction.

**Sternaman Pattern Shop,** 532 West North Avenue, Flora, Ill., organized recently by **C. J. Sternaman,** manufactures brass and aluminum pattern castings, wood patterns, etc. Mr. Sternaman states he is interested in supplies and information on finish of aluminum castings that will stay white and not corrode under weather conditions, or an alloy that can be sand blasted but will not tarnish.

**Foundry Equipment Company,** 1831 Columbus Road, Cleveland, Ohio, has acquired the industrial oven department of the **Swartout Company,** 18511 Euclid Avenue, according to a recent announcement by **C. A. Barnett,** president of the former company. The Swartout technical staff is being retained, under the direction of **C. F. Mayer. J. Tuteur** is chairman of the board of the Foundry Equipment Company, **O. D. Conover** is vice-president, **A. V. Cannon,** secretary, and **A. F. Woehrmann,** treasurer.

**Universal Bearing Metals Corporation,** Rochester, N. Y., has purchased entire assets, processes, good will, patents, etc., of **Bearium Bearings, Inc.,** Rochester, and will continue to sell latter company's products through same outlets as heretofore, without change in sales or operating forces. Universal is a privately owned concern, principal stockholders being **Dr. H. M. Rees,** Boston, Mass.; **Howard Coonley,** president of **Walworth Company,** Boston; **C. F. Wray,** secretary and treasurer of **National Brass Manufacturing Company; Delos Wray,** president of **Henry Wray and Son.** Officers of company are **E. P. Langworthy,** president and treasurer; Dr. Rees, vice-president and secretary. Directors are Dr. Rees and Messrs. Coonley and Langworthy. Company operates a brass and bronze foundry.

One of the features of the exhibit made by **Northern Blower Company,** Cleveland, Ohio, at the Ohio Safety Congress held at Columbus, Ohio, last month was a working model of a "Norblo" dust collecting system fitted to a set of miniature buffing lathes, saws, planers, etc. The collecting system included a complete outfit of ducts, exhaust hoods, a cyclone collector, blast-gates, etc., and enabled the two "Norblo" representatives present, **L. L. Eiben** and his assistant, **Mr. Pike,** to demonstrate the manner in which dust, shavings, etc., can be removed from the air of workshops by air-suction. A method of dealing with dangerous fumes was demonstrated by a complete working model outfit of a chromium plating tank fume removal equipment. In the model smoke from an incense burner took the place of the invisible and deadly chromic acid fumes dealt with in actual practice.

# Review of the Wrought Metal Business

## The Past Month and Year and a Forecast for 1930

By J. J. WHITEHEAD

**President of the Whitehead Metal Products Co. of New York, Inc.**

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

FEBRUARY 1, 1930.

Events during the month of January add but little to the industrial situation. It is apparent, however, that gradually a firmer industrial tone is being established. This slow process of re-establishing confidence will undoubtedly continue until such time as more decisive steps are warranted. Indicators do not show that a gigantic business revival is going to start immediately. However, with small inventories and with money in plentiful supply, there will surely be more industrial activity.

In the copper and brass industries the let down that occurred in December was offset by the good pick-up in January. However, this seasonal recovery is no indication that a tremendous demand for copper or brass products will occur during the month of February. It has been noticed, rather, that a much firmer tone dominates the situation. Where materials are being purchased they are for immediate shipment, because no stocks exist and it is a question of keeping plants in operation. Orders seem to be holding up well, but no one is carrying large stocks.

The copper producers have maintained the price at 18c in the face of the most discouraging obstacles. As they have carried on thus far, it is reasonable to assume that the price of 18c is firmly established. Purchasing of copper to meet immediate requirements is believed to be the last step necessary in the stabilization of the metal. If consumers will only continue to purchase their requirements regularly and not come into the market all at once everyone would be happy. Even now consumers are holding off purchasing their full requirements and it is not beyond the realm of possibility that a little later they will all endeavor to cover their needs at the same time.

Fortunately, however, this spring the stocks of copper are larger than they were last year. The refined stocks were about 178,000 tons as of January 1, 1930. Producers are curtailing production and should an abnormal demand for copper occur a little later on production will probably have to be increased. Those interested in a fluctuating price for copper certainly have not so far been able to get it below 18c, and it remains to be seen what effect, if any, an accumulated buying power will have on the situation.

It is safe to assume that probably as much copper will be used in 1930 as in 1929 or 1928. The purchasing of copper at a normal rate has not been apparent so far, but that the copper will ultimately have to be bought is almost certain. Excess scrap and other forms of metal, wherever possible, have been used and all such metal is now out of the way. The month of February, it is believed, will clarify the situation.

The demand for Monel metal is holding up in a remarkable way. Much prompter deliveries are now possible, but at the same time it is just as well to anticipate needs well in advance.

There is no abatement in the demand for nickel and requirements must be anticipated well in advance.

The outlook is much more encouraging than it was a month ago. Everyone is just settling down to work in good shape and it is expected that before February passes an upward trend will have been definitely established for business activity.

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# Metal Market Review

By R. J. HOUSTON

**D. Houston and Company, Metal Brokers, New York**

WRITTEN ESPECIALLY FOR THE METAL INDUSTRY

### COPPER

FEBRUARY 1, 1930.

Despite comparatively quiet conditions in copper the market has held steadily to 18 cents Connecticut delivery and 18.30 cents c. i. f. European ports. Substantial sales were made at these prices, usually for nearby deliveries. Export trade was maintained on a large scale throughout January, although the pace of recent demand was not fully up to average normal activity. Domestic consumers have been taking moderate tonnages to cover near positions, but there has been no aggressively strong buying by the home trade recently.

The situation here is being closely watched. Increased urgency of needs is likely to give fresh incentive to broader movements both at home and abroad. All factors are awaiting further developments with keen interest. A big spurt in demand may develop at any time and greater activity at consuming plants would undoubtedly send manufacturers into the market for heavy supplies of raw material.

Last year the output of American refined copper amounted to 3,623,714,000 pounds. Of this amount there was delivered on domestic account and for export a total of 3,412,006,000 pounds, or more than 94 per cent of the entire product. Surplus stocks of refined on January 1 were 342,640,000 pounds, as against 253,838,000 pounds on December 1, an increase of 88,802,000 pounds. Restricted domestic deliveries and reduced exports were responsible for the heavy increase in stocks.

### ZINC

Large volume buying and lower prices were the conspicuous features in zinc last month. The market was heavy for many weeks and under pressure it struck the 5-cent level at Mid-West points shortly after the middle of January. As a result of the decline consumers in general bought freely for nearby delivery. Interest was also developed for future positions, but the trend of prices changed for the better and offerings were more restricted. There were some transactions for first and second quarter shipments, however, but with the market lifted out of its rut the tone strengthened and the price advanced to 5¼c. East St. Louis. Weak holdings appeared to be closed out and recent conditions appeared to reflect some slight improvement in the industry.

### TIN

Recent movements in tin were accompanied with a definite trend downward in market prices. The situation was specially weak in the second half of January when a low of 37⅞c. was established for prompt Straits. This was the lowest level since July, 1923. It is evident that the market is still under the sway of adverse conditions. Developments have been disappointing to the group of producers who have attempted to stem the downward course of prices by restricting output in Malaya, Nigeria and Bolivia. In spite of these efforts there were successive market recessions which created an irregular and unsettled situation. The new low brought both consumers and dealers into the market, and a large business was done for both prompt and future deliveries. Evidently producers are trying to strengthen their position by regulating output to demand, but curtailment has not been drastic enough to produce a bull market.

The price of Straits tin near the end of January was 38⅛c. for spot delivery. This price contracted with the high quotation last year of 50⅜c.

### ALUMINUM

The position of aluminum seems firmly established on a stabilized price basis. Being a strongly controlled product action of the market is singularly free from sporadic fluctuations. Demand

has been fairly good although capable of improvement. Consumption in Mid-Western territory is expected to increase as automobile output expands.

### LEAD

Demand for lead since the beginning of the year has been active and the undertone of the market is firm at 6.10c. East St. Louis and 6.25c. New York. Producers have booked orders in heavy volume for prompt and future delivery. Present prices have remained in effect since early in November, 1929, and are the lowest in nearly a year and a half. Consumers have taken advantage of this situation and the various lead consuming industries have bought liberal tonnages for February and March shipment. Some sellers are not keen to accept March and April orders at current prices as prompt stocks have been well absorbed by trade demand. Reserves also have been cut down in order to fill demand. Under these circumstances consumers undoubtedly feel that they have covered a large part of first quarter requirements on favorable terms. The statistical position showed a very substantial decrease in both production and surplus stocks for the month of December. The lead market may be expected to broaden in scope and activity. A higher price level also is likely as the year progresses.

### ANTIMONY

A moderate amount of new buying of antimony developed in January, and there was a slight advance in price to 8¾c. for prompt and nearby delivery of Chinese regulus duty paid. The improved feeling and better demand is owing to existing consuming requirements and to some extent from the effect of proposed tariff changes on prices. Buyers of c. i. f. shipments from China have to run the risk of an upward revision in the rates of duties. Importers and consumers are therefore pretty much at sea regarding probable costs when shipments are landed here two or three months hence. The present duty on antimony regulus is 2 cents a pound. Recent business was done for shipment from China at 6 cents c. i. f. New York, but subsequent offers for Chinese account were raised to 6⅛c. c. i. f. New York. On all c. i. f. business buyers become obligated to pay whatever rate of duty prevails on discharge of shipments here. Sales also have been made in bond at 6⅝c. Spot regulus quotes 8¾c. duty paid.

### QUICKSILVER

There was a quiet and easy tone reported in quicksilver. Stocks are not excessive but in sufficient supply for current requirements. Spot material quotes $123 to $124.50 per flask. Imports in November amounted to 171,712 pounds, as against 76,877 pounds in November, 1928.

### PLATINUM

Inquiry is not specially active. Refined platinum is quoted at $59 to $60 per ounce.

### SILVER

The outstanding feature in the silver situation continues to be the low market price and the absence of any stabilizing factor to restore normal values. Depression and conditions that produce that deplorable condition are overshadowing influences in the market for the white metal. The world has been faced with excessive supplies which cannot be absorbed. Heavy production has been augmented by the addition of demonetized coins in England, France and other European countries. India also has been a seller of large quantities, and the marketing of supplies from so many sources has created an abnormally low price for the commodity in all parts of the world. The arts and industries and silverware manufacturers in this country used more silver in 1929 than ever before. But these factors are of minor importance compared with the consuming demand which has hitherto come from India and China. It is obvious that further overproduction will accentuate the obstacles to market recovery. The recent price of silver bullion was the lowest in all history since records began. The market is still sensitive and far from giving indications of being definitely headed toward permanent and satisfactory improvement.

### OLD METALS

Business in scrap metals has developed more activity lately. A better demand for copper and brass grades is noted. Domestic buyers and foreign consumers are taking heavier tonnages of selected material. A good movement in the copper grades has provided a free outlet for supplies, particularly for domestic account. There are apparently no offerings of choice packings pressing on the market. Steady shipments have been going forward to the electrolytic refineries at good prices. A steadier tone for lead and zinc scrap is a feature, with indications of a broader demand in the coming weeks. Prices dealers fix for buying quote 15c. to 15¼c. for crucible copper of best grade, 14c. to 14¼c. for heavy copper and wire, 11¾c. to 12c. for light copper, 7½c. to 7¾c. for heavy brass, 10½c. to 10¾c. for new brass clippings, 4c. to 4¼c. for heavy lead, and 15½c. to 15¾c. for aluminum clippings.

# Daily Metal Prices for the Month of January, 1930

## Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

| | 1* | 2 | 3 | 6 | 7 | 8 | 9 | 10 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Copper** c/lb. Duty Free | | | | | | | | | | | | | |
| Lake (Del.) | | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 |
| Electrolytic (f. a. s. N. Y.) | | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 |
| Casting (f. o. b. N. Y.) | | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 |
| **Zinc** (f. o. b. St. L.) c/lb. Duty 1¾c/lb. | | | | | | | | | | | | | |
| Prime Western | | 5.45 | 5.45 | 5.40 | 5.35 | 5.25 | 5.25 | 5.25 | 5.25 | 5.15 | 5.15 | 5.125 | 5.10 |
| Brass Special | | 5.55 | 5.55 | 5.50 | 5.40 | 5.35 | 5.35 | 5.35 | 5.35 | 5.25 | 5.25 | 5.225 | 5.20 |
| **Tin** (f. o. b. N. Y.) c/lb. Duty Free | | | | | | | | | | | | | |
| Straits | | 39.625 | 38.875 | 38.75 | 39.625 | 39.375 | 39.25 | 39.25 | 38.75 | 38.75 | 38.875 | 39.00 | 38.50 |
| Pig 99% | | 38.875 | 38.00 | 37.875 | 38.75 | 38.625 | 38.75 | 38.875 | 38.25 | 38.25 | 38.375 | 38.50 | 38.00 |
| **Lead** (f. o. b. St. L.) c/lb. Duty 2½c/lb. | | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 |
| **Aluminum** c/lb. Duty 5c/lb. | | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 |
| **Nickel** c/lb. Duty 3c/lb. | | | | | | | | | | | | | |
| Ingot | | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Shot | | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Electrolytic | | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| **Antimony** (J. & Ch.) c/lb. Duty 2c/lb. | | 8.50 | 8.50 | 8.375 | 8.375 | 8.30 | 8.30 | 8.50 | 8.50 | 8.50 | 8.50 | 8.75 | 8.75 |
| **Silver** c/oz. Troy Duty Free | | 46.875 | 46.375 | 44.75 | 44.75 | 43.875 | 44.75 | 44.50 | 46.25 | 45.625 | 46.25 | 46.00 | 45.00 |
| **Platinum** $/oz. Troy Duty Free | | 61.00 | 61.00 | 61.50 | 60.00 | 60.00 | 60.00 | 60.00 | 60.00 | 60.00 | 60.00 | 60.00 | 60.00 |

| | 20 | 21 | 22 | 23 | 24 | 27 | 28 | 29 | 30 | 31 | High | Low | Aver. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Copper** c/lb. Duty Free | | | | | | | | | | | | | |
| Lake (Del.) | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 |
| Electrolytic (f. a. s. N. Y.) | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 | 18.00 |
| Casting (f. o. b. N. Y.) | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 | 17.00 |
| **Zinc** (f. o. b. St. L.) c/lb. Duty 1¾c/lb. | | | | | | | | | | | | | |
| Prime Western | 5.10 | 5.15 | 5.20 | 5.25 | 5.25 | 5.30 | 5.25 | 5.25 | 5.25 | 5.25 | 5.45 | 5.10 | 5.247 |
| Brass Special | 5.20 | 5.25 | 5.30 | 5.35 | 5.35 | 5.40 | 5.35 | 5.35 | 5.35 | 5.35 | 5.55 | 5.20 | 5.344 |
| **Tin** (f. o. b. N. Y.) c/lb. Duty Free | | | | | | | | | | | | | |
| Straits | 38.375 | 37.80 | 38.20 | 38.25 | 38.375 | 38.75 | 39.375 | 39.75 | 39.45 | 39.125 | 39.75 | 37.80 | 38.913 |
| Pig 99% | 37.875 | 37.30 | 37.70 | 37.625 | 37.75 | 38.125 | 38.75 | 39.125 | 38.75 | 38.50 | 39.125 | 37.30 | 38.301 |
| **Lead** (f. o. b. St. L.) c/lb. Duty 2½c/lb. | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 | 6.10 |
| **Aluminum** c/lb. Duty 5c/lb. | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 | 24.30 |
| **Nickel** c/lb. Duty 3c/lb. | | | | | | | | | | | | | |
| Ingot | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| Shot | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 | 36 |
| Electrolytic | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 | 35 |
| **Antimony** (J. & Ch.) c/lb. Duty 2c/lb. | 8.75 | 8.75 | 8.75 | 8.75 | 8.75 | 8.75 | 8.75 | 8.75 | 8.75 | 8.75 | 8.75 | 8.30 | 8.607 |
| **Silver** c/oz. Troy Duty Free | 45.375 | 45.25 | 44.875 | 44.625 | 44.25 | 44.375 | 44.50 | 44.25 | 43.75 | 43.25 | 46.875 | 43.25 | 44.977 |
| **Platinum** $/oz. Troy Duty Free | 60.00 | 60.00 | 60.00 | 60.00 | 60.00 | 60.00 | 60.00 | 59.00 | 59.00 | 59.00 | 61.50 | 59.00 | 60.023 |

*Holiday.

# Metal Prices, February 3, 1930

## NEW METALS

**Copper:** Lake, 18.125. Electrolytic, 18.00. Casting, 17.00.
**Zinc:** Prime Western, 5.25. Brass Special, 5.35.
**Tin:** Straits, 38.875. Pig, 99%, 38.25.
**Lead:** 6.10. **Aluminum,** 24.30. **Antimony,** 8.75.

**Nickel:** Ingot, 35. Shot, 36. Elec., 35. Pellets, 40.
**Quicksilver:** flask, 75 lbs., $124.00. **Bismuth,** $1.70.
**Cadmium,** 90. **Cobalt,** 97%, $2.60. **Silver,** oz., Troy, 43.625.
**Gold:** oz., Troy, $20.67. **Platinum,** oz., Troy, $59.00.

## INGOT METALS AND ALLOYS

| | |
|---|---|
| Brass Ingots, Yellow | 12¼to12½ |
| Brass Ingots, Red | 15½to15¾ |
| Bronze Ingots | 16½ |
| Casting Aluminum Alloys | 21 to24 |
| Manganese Bronze Castings | 27 to39 |
| Manganese Bronze Ingots | 13½to19 |
| Manganese Bronze Forging | 35 to43 |
| Manganese Copper, 30% | 25 to35 |
| Monel Metal Shot | 28 |
| Monel Metal Blocks | 28 |
| Parsons Manganese Bronze Ingots | 16½to19¾ |
| Phosphor Bronze | 17 to21 |
| Phosphor Copper, guaranteed 15% | 20½to24 |
| Phosphor Copper, guaranteed 10% | 20 to23½ |
| Phosphor Tin, no guarantee | 45 to60 |
| Silicon Copper, 10%, according to quality | 25 to35 |

## OLD METALS

| Buying Prices | | Selling Prices |
|---|---|---|
| 14 to14½ | Heavy Cut Copper | 15 to15½ |
| 13½to13¾ | Copper Wire, mixed | 14½to14¾ |
| 12 to12¼ | Light Copper | 13 to13¼ |
| 11 to11¼ | Heavy Machine Composition | 12 to12¼ |
| 7¾to 8 | Heavy Brass | 8¾to 9 |
| 6¼to 6¾ | Light Brass | 7¼to 7¾ |
| 11 to11¼ | No. 1 Composition | 12 to12¼ |
| 10 to10¼ | Composition Turnings | 11 to11¼ |
| 4⅜to 4⅞ | Heavy Lead | 5⅜to 5⅞ |
| 2½to 3 | Zinc Scrap | 3½to 4 |
| 15½to16 | New Aluminum Clips | 19½to20 |
| 10 to10¼ | Scrap Aluminum, cast alloyed | 15 to15¼ |
| 10½to11 | Scrap Aluminum sheet (new) | 13 to14 |
| 24 to26 | No. 1 Pewter | 29 to30 |
| 20 to21 | Old Nickel Anodes | 22 to23 |
| 20 to23 | Old Nickel | 22 to25 |

# Wrought Metals and Alloys

## COPPER SHEET

Mill shipment (hot rolled) .....27¾c. to 28¾c. net base
From Stock .....28¾c. to 29¾c. net base

## BARE COPPER WIRE

19⅝c. to 19⅞c. net base, in carload lots.

## COPPER SEAMLESS TUBING

29¼c. to 30¼c., net base.

## SOLDERING COPPERS

300 lbs. and over in one order .....26¼c. net base
100 lbs. to 200 lbs. in one order .....26¾c. net base

## ZINC SHEET

Duty on sheet, 2c., per pound — Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 7 per cent discount .....10.50 net base
Casks, jobbers' price .....10.75 net base
Open casks, jobbers' price .....11.25to11.75 net base

## ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price, ton lots.....33.30c.
Aluminum coils, 24 ga., base price, ton lots.....31.00c.

## ROLLED NICKEL SHEET AND ROD

Net Base Prices

| | | | |
|---|---|---|---|
| Cold Drawn Rods..... | 53c. | Cold Rolled Sheet..... | 60c. |
| Hot Rolled Rods..... | 45c. | Full Finished Sheet..... | 52c. |

## BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more 10½c. over N. Y. Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

## SILVER SHEET

Rolled sterling silver 47.00c. per ounce, Troy upward, according to quantity.

## BRASS MATERIAL—MILL SHIPMENTS

In effect April 16, 1929
To customers who buy 5,000 lbs. or more in one order.

| | Net base per lb. High Brass | Low Brass | Bronze |
|---|---|---|---|
| Sheet | $0.23¼ | $0.25 | $0.26¼ |
| Wire | .23¾ | .25½ | .26¾ |
| Rod | .21¾ | .25¾ | .27 |
| Brazed tubing | .30⅞ | .... | .35⅞ |
| Open seam tubing | .31¼ | .... | .34¼ |
| Angles and channels | .31¼ | .... | .34¼ |

## BRASS SEAMLESS TUBING

28¼c. to 29¼c. net base.

## TOBIN BRONZE AND MUNTZ METAL

| | |
|---|---|
| Tobin Bronze Rod | 25¾c. net base |
| Muntz or Yellow Metal Sheating (14"x48") | 24c. net base |
| Muntz or Yellow Rectangular sheet other Sheating | 25c. net base |
| Muntz or Yellow Metal Rod | 22¼c. net base |

Above are for 100 lbs. or more in one order.

## NICKEL SILVER (NICKELENE)

Net Base Prices

| Grade "A" Sheet Metal | | Wire and Rod | |
|---|---|---|---|
| 10% Quality | 31⅜c. | 10% Quality | 34⅛c. |
| 15% Quality | 33c. | 15% Quality | 37¾c. |
| 18% Quality | 34¼c. | 18% Quality | 41c. |

## MONEL METAL, SHEET AND ROD

| | | | |
|---|---|---|---|
| Hot Rolled Rods (base) | 35 | Full Finished Sheets (base) | 42 |
| Cold Drawn Rods (base) | 40 | Cold Rolled Sheets (base) | 50 |

## BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c. over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs. 25c. over. Prices f. o. b. mill.

# Supply Prices, February 3, 1930

## ANODES

| | | | | | |
|---|---|---|---|---|---|
| **Copper:** Cast | 28c. | per lb. | **Nickel:** 90-92% | 45c. | per lb. |
| Rolled, oval | 27c. | per lb. | 95-97% | 47c. | per lb. |
| Rolled, sheets, trimmed | 25¼c. | per lb. | 99% | 49c. | per lb. |
| **Brass:** Cast | 27c. | per lb. | **Silver:** Rolled silver anodes .999 fine are quoted from 47¾c., Troy ounce, upward, depending upon quantity. | | |
| **Zinc:** Cast | 12⅛c. | per lb. | | | |

## FELT POLISHING WHEELS WHITE SPANISH

| Diameter | Thickness | Under 100 lbs. | 100 to 200 lbs. | Over 200 lbs. |
|---|---|---|---|---|
| 10-12-14 & 16" | 1" to 3" | $3.00/lb. | $2.75/lb. | $2.65/lb. |
| 6-8 & Over 16 | 1 to 3 | 3.10 | 2.85 | 2.75 |
| 6 to 24 | Under ½ | 4.25 | 4.00 | 3.90 |
| 6 to 24 | ½ to 1 | 4.00 | 3.75 | 3.65 |
| 6 to 24 | Over 3 | 3.40 | 3.15 | 3.05 |
| 4 up to 6 | ¼ to 3 | 4.85 | 4.85 | 4.85 |
| 4 up to 6 | Over 3 | 5.25 | 5.25 | 5.25 |
| Under 4 | ¼ to 3 | 5.45 | 5.45 | 5.45 |
| Under 4 | Over 3 | 5.85 | 5.85 | 5.85 |

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

## COTTON BUFFS

Full Disc Open buffs, per 100 sections.

| | |
|---|---|
| 11" 20 ply 64/68 Unbleached | $28.19 |
| 14" 20 ply 64/68 Unbleached | 32.16 to 39.14 |
| 11" 20 ply 80/92 Unbleached | 32.62 |
| 14" 20 ply 80/92 Unbleached | 34.28 to 46.09 |
| 11" 20 ply 84/92 Unbleached | 38.30 |
| 14" 20 ply 84/92 Unbleached | 42.90 to 62.34 |
| 11" 20 ply 80/84 Unbleached | 39.56 |
| 14" 20 ply 80/84 Unbleached | 47.01 to 62.71 |
| Sewed Pieced Buffs, per lb., bleached | 52c to 71c |

## CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

| | | |
|---|---|---|
| Acetone | lb. | .11-12 |
| Acid—Boric (Boracic) Crystals | lb. | .08½ |
| Chromic, 75 to 400 lb. drums | lb. | .19-21 |
| Hydrochloric (Muriatic) Tech., 20 deg., carboys | lb. | .02 |
| Hydrochloric, C. P., 20 deg,, carboys | lb | .06 |
| Hydrofluoric, 30%, bbls | lb. | .08 |
| Nitric, 36 deg., carboys | lb. | .06 |
| Nitric, 42 deg., carboys | lb. | .07 |
| Sulphuric, 66 deg., carboys | lb. | .02 |
| Alcohol—Butyl | lb. | .16¾-.21¼ |
| Denatured, drums | gal. | .52-.60 |
| Alum—Lump, barrels | lb. | .0325 |
| Powdered, barrels | lb. | .039 |
| Ammonium chloride, solution in carboys | lb. | .06½ |
| Ammonium—sulphate, tech., bbls | lb. | 3.3 |
| Sulphocyanide | lb. | .65 |
| Arsenic, white, kegs | lb | .05 |
| Asphaltum | lb. | .35 |
| Benzol, pure | gal. | .60 |
| Borax Crystals (Sodium Biborate), bbls | lb. | .04½ |
| Calcium Carbonate (Precipitated Chalk) | lb. | .04 |
| Carbon Bisulphide, Drums | lb. | .06 |
| Chrome Green, bbls. | lb. | .25 |
| Chromic Sulphate | lb. | .30-.40 |
| Copper—Acetate (Verdigris) | lb. | .23 |
| Carbonate, bbls. | lb. | .21½ |
| Cyanide (100 lb. kgs) | lb. | .45 |
| Sulphate, bbls. | lb. | 6.7 |
| Cream of Tartar Crystals (Potassium Bitartrate) | lb. | .27 |
| Crocus | lb. | .15 |
| Dextrin | lb. | .05-.08 |
| Emery Flour | lb. | .06 |
| Flint, powdered | ton | $30.00 |
| Fluor-spar (Calcic fluoride) | ton | $70.00 |
| Fusel Oil | gal. | $4.45 |
| Gold Chloride | oz. | $12.00 |
| Gum—Sandarac | lb. | .26 |
| Shellac | lb. | .59-.61 |
| Iron Sulphate (Copperas), bbl. | lb. | .01½ |
| Lead Acetate (Sugar of Lead) | lb. | .13¼ |
| Yellow Oxide (Litharge) | lb. | .12½ |
| Mercury Bichloride (Corrosive Sublimate) | lb. | $1.58 |
| Nickel—Carbonate, dry bbls. | lb. | .35 |
| Chloride, bbls. | lb. | .20 |
| Salts, single, 300 lb. bbls. | lb. | .12½-.13 |
| Salts, double, 425 lb. bbls. | lb. | .12½-.13 |
| Paraffin | lb. | .05-.06 |
| Phosphorus—Duty free, according to quantity | lb. | .35-.40 |
| Potash, Caustic Electrolytic 88-92% broken, drums | lb. | .093 |
| Potassium Bichromate, casks (crystals) | lb. | .09¼ |
| Carbonate, 96-98% | lb. | .06¾-.07 |
| Cyanide, 165 lb. cases, 94-96% | lb. | .57½ |
| Pumice, ground, bbls. | lb. | .02½ |
| Quartz, powdered | ton | $30.00 |
| Rosin, bbls. | lb. | .04½ |
| Rouge, nickel, 100 lb. lots | lb. | .25 |
| Silver and Gold | lb. | .65 |
| Sal Ammoniac (Ammonium Chloride) in casks | lb. | .05½ |
| Silver Chloride, dry, 100 oz. lots | oz. | .37½ |
| Cyanide (fluctuating) | oz. | .45-.50 |
| Nitrate, 100 ounce lots | oz. | .32¼ |
| Soda Ash, 58%, bbls. | lb. | .02½ |
| Sodium—Cyanide, 96 to 98%, 100 lbs. | lb. | .17 |
| Hyposulphite, kegs | lb. | .04 |
| Nitrate, tech., bbls. | lb. | .04¾ |
| Phosphate, tech., bbls. | lb. | .03¾ |
| Silicate (Water Glass), bbls. | lb. | .02 |
| Sulpho Cyanide | lb. | .32½ |
| Sulphur (Brimstone), bbls. | lb. | .02 |
| Tin Chloride, 100 lb kegs | lb. | .34 |
| Tripoli, Powdered | lb. | .03 |
| Wax—Bees, white, ref. bleached | lb. | .60 |
| Yellow, No. 1 | lb. | .45 |
| Whiting, Bolted | lb. | .02½-.06 |
| Zinc, Carbonate, bbls. | lb. | .11 |
| Chloride, casks | lb. | .06¾ |
| Cyanide (100 lb. kegs) | lb. | .41 |
| Sulphate, bbls. | lb. | .03½ |